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Some Tools Used in Making Phonograph Tone-Arms

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Ingenious Tools for Thin Metal Work—Making Difficult Angular Parts from Tubing—Fixtures for Assembling and Holding Parts to be Soldered

A PHONOGRAPH tone arm must be accurately built and while it must swing with the slightest pressure there must be no slack in the bearings. As the movement of the tone arm is guided solely by the spiral grooves in the record, it is evident that unless the bearings are well nigh frictionless the wear on the record will be excessive.

An assembled universal tone arm and sound box, as made by the Presto Phono Parts Corporation, Brooklyn, N. Y., where the data and illustrations for this article were obtained, are shown in Fig. 1. It will be seen that the whole arm is arranged so as to swing in a horizontal plane while the sound box can be turned on its angular mounting to present a right angle to the center line of the arm. This arrangement permits the use of either a record with undulations in the bottom of the groove ("hill and dale") or one with the undulations in the side of the groove ("lateral") on the same machine.

In addition to the horizontal movement the tone arm is so pivoted as to allow a slight up and down movement in order that the needle will bear with equal weight at both the top and bottom of the undulations. It must be understood, however, that all the weight of the overhanging arm is not borne by the needle and record as the weight is partly balanced by the pull spring *A* at the rear of the pivotal point.

The bracket supporting the tone arm revolves on a ball bearing and is in turn mounted in and supported by an outer bracket to which it is pivoted at *B*. The top and bottom races of the bearing are formed in the lower part of the inner bracket and the upper side of the base of the outside bracket. As the machining of the two brackets is an ordinary lathe job, except for the special fixtures for holding them, no details are necessary. However, having been made, their accuracy must be tested and the gages and parts to be tested are shown in Fig. 2. *A* is the outer bracket and *B* is the gage. The bottom of the gage has a projecting ring which the lower half of the ball race in the bracket must fit. With the gage in position, the hardened pin at the top is placed in the pivot hole in the top of the bracket and pushed into the hardened bushing at the top of the gage and while so located the gage must revolve without binding.

The inner bracket *C* is tested by the gage *D* in a like manner except that the gaging pin for the pivot has a point like a lathe center and enters a conical hole in the top of the bracket. The base of the gage has an upwardly projecting ring which the upper half of the ball race in the bracket must fit. With the bracket located in the gage and the pivot pin in the conical hole the bracket is revolved instead of the gage as in the former case. The holes *E* are for the screws upon which the arm is pivoted for its up and down motion, while the holes *H* are for pins to limit that motion. One of these pins also serves for holding one end of the balancing spring.

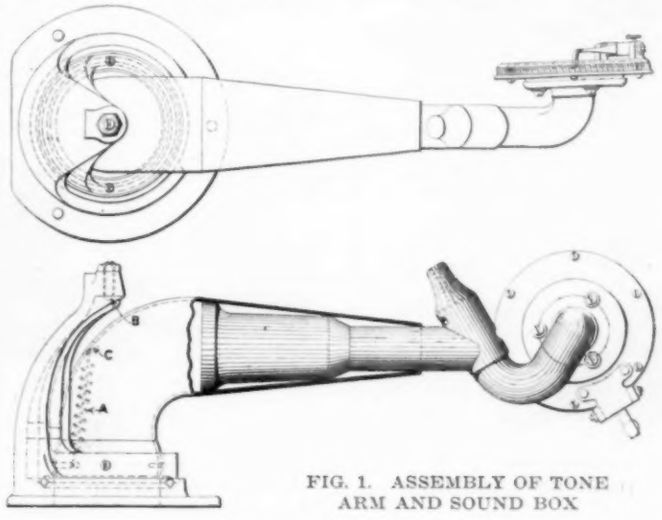


FIG. 1. ASSEMBLY OF TONE ARM AND SOUND BOX

The arm proper, as shown in Fig. 3, is made up of three pieces, the elbow *A*, the tapered tube *B* and the insert *C*. The elbow, Fig. 4, must be faced true at both outlets and for this operation is held in the box jig shown in Fig. 5. The facing tools at the right are made with bodies that fit the bushings in the jig and are provided with collars so located in relation to

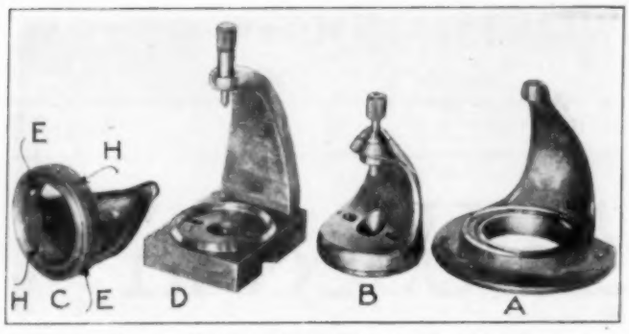


FIG. 2. GAGES FOR TESTING BRACKETS

the cutters that when they contact with the bushings the outlets will be faced to the proper dimensions. After one outlet has been faced the jig is rolled over 90 deg. to present the other outlet to the facing tool. The gage to be seen with the elbow on top of the jig shows whether or not the operation has been correctly done.

The holes for the pivot screws and the slots for limiting the vertical movement of the arm are both punched with press tools of similar construction so that only one set will be described. The tools for punching the limiting slots are shown in Fig. 6. The lower

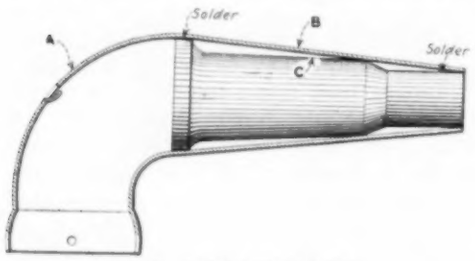


FIG. 3. THE TONE ARM

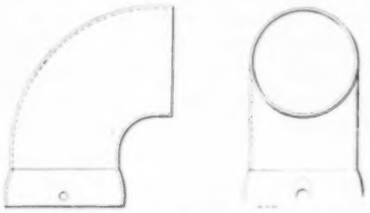


FIG. 4. THE TONE-ARM ELBOW

outlet of the elbow is placed on a stud containing the dies in its sides and located by the pivot holes which have previously been punched. The punches slide horizontally and are forced inwardly by the wedges *A* on

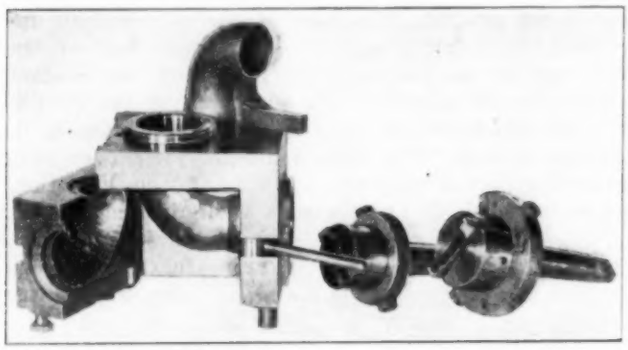


FIG. 5. JIG AND TOOLS FOR FACING TONE ARM ELBOW

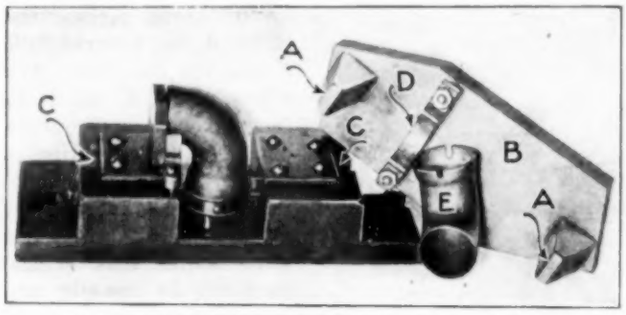


FIG. 6. TOOLS FOR PUNCHING SLOTS IN TONE-ARM ELBOW

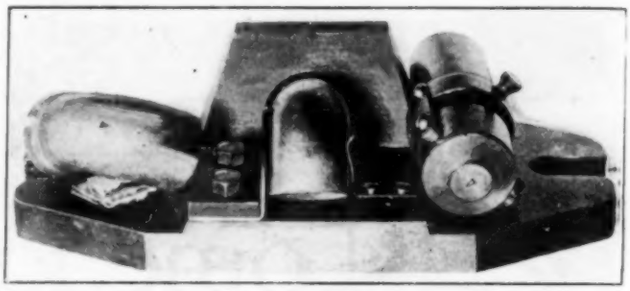


FIG. 7. TOOLS FOR FORMING THE SPRING HOOK

the plate *B* attached to the ram of the press, the punch slides being bevelled at *C* to correspond with the wedges. The punches are normally held in their outward positions by springs which return them to that position when the press ram ascends. Before the punches reach the work, the spring pressure-pad *D* contacts with the upper part of the elbow and holds it firmly while the punches do their work. An elbow with both slots punched is shown at *E*.

One other operation, forming the hook for the counterbalancing spring, completes the elbow. This hook can be seen at *C*, Fig. 1, with the upper end of the spring looped over it. The tools for forming the hook are shown in Fig. 7 and as can be seen, the punch is

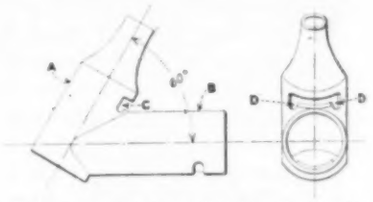


FIG. 8. BARREL-JOINT ASSEMBLY

provided with a spring pressure-pad to hold the elbow in position during the operation. The punch is triangular in shape and shears the metal at its apex and on the two sides down to the base only and at the same time bends inwardly the sheared metal thus forming the hook.

The barrel joint upon which the sound box swings is made up from two parts and is shown assembled in

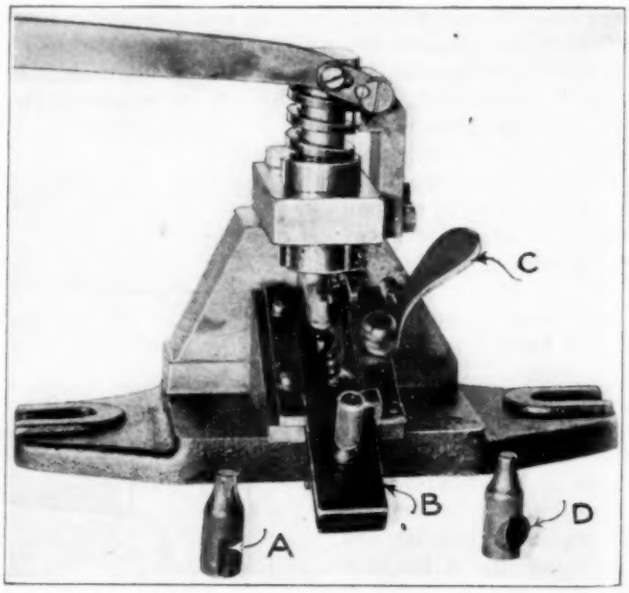


FIG. 9. TOOLS FOR FORMING PROTRUSION ON PART OF BARREL JOINT

Fig. 8. The part *B* fits over a protrusion on part *A*, the two parts forming an included angle of 60 deg. when assembled. The method of forming the protrusion on part *A* is quite ingenious. The first operation consists in punching a slot as shown at *A*, Fig. 9. The piece is then placed in the hand press shown in the illustration, part of the punch being cut away to clear the piece when it enters the die and assumes the angle to which the die is made. With the piece located in the die, the slide *B* is pushed in and locked by the eccentric lever *C*, holding the piece firmly while the punch is brought down by the hand lever at the top, forcing out the protrusion as shown at *D*.

The other part of the joint must fit tightly over the protrusion thus made and the edges make a close fit around the body. In order to accomplish this a tube of twice the required length is placed in the inclined recess of the jig shown in Fig. 10. The step-pointed end mill *B* is then run down through the wall of the tube, completely severing it and producing two parts, *C* and *D*, both of which will fit properly.

Before assembly of the barrel joint, the part *A*, Fig. 8, has a plain slot punched at *C* which must afterward have notches *D* at each end. These notches are not cut until after the joint has been assembled as their location must have a certain reference both to the location and direction of the straight tube *B*. The tools for punching the notches are illustrated in Fig. 11. The assembled joint is placed on the stud *A* which also contains the dies. The punches are mounted on slides placed at an included angle of 90 deg. and are operated by the descending ram of the press through the inclined wings *B* on the plate *C*. The lever at the right operates the ejector for removing the work. As the ram of the press ascends, springs return the punches to the normal position.

The sound-box elbow is rather a crooked piece of

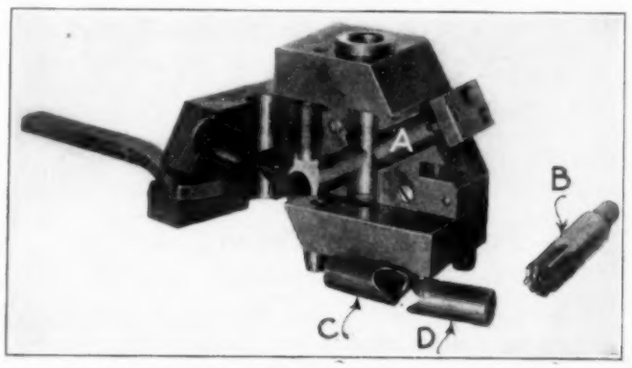


FIG. 10. TOOLS FOR CUTTING TUBES FOR BARREL JOINT

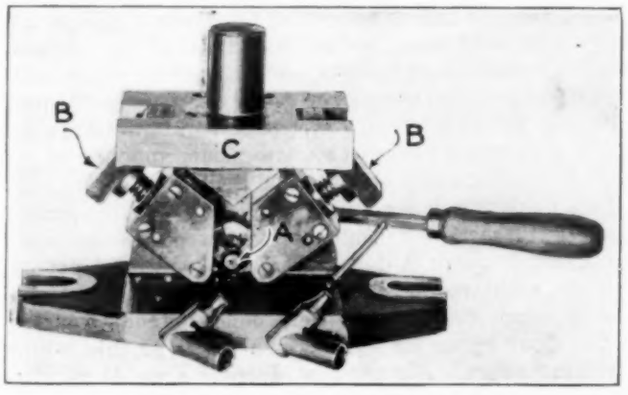


FIG. 11. NOTCHING TOOLS FOR BARREL JOINT

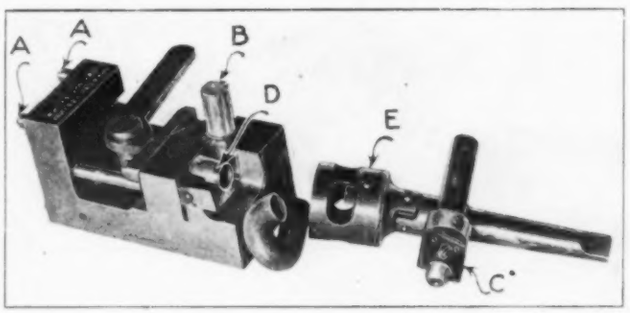


FIG. 12. FACING AND SIZING TOOLS FOR SOUND-BOX ELBOW

tubing and it is necessary to face both outlets and to size the outside diameter of the short end so as to make a tight fit in the flange to which it is afterward to be assembled. Both operations are performed in the fixture and by the tools shown in Fig. 12. As the two ends are not at a right angle with each other, the feet of the fixture (two of which can be seen at *A*) are not of equal length so that when the fixture is stood upon them the end *D* of the work will be presented to the cutter at the proper angle. The end *B* is faced and the inside chamfered by the tool *C*. The end *D* in addition to being faced has the outside sized by the tool *E*. This tool has a floating member, as can be seen from the illustration, and carries a hardened bushing which is slightly bell mouthed. With the tool revolving in a drilling machine spindle it is brought down over the work and the bushing spins the metal at the end to the proper size. After being assembled to the flange, a peculiarly shaped hole covering more than half the circumference of the tube is punched near one end. An elbow showing this hole at *A* may

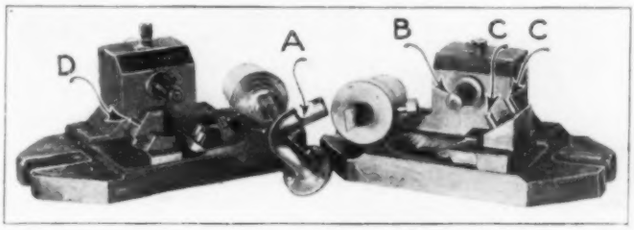


FIG. 13. TOOLS FOR PUNCHING HOLE IN SOUND-BOX ELBOW

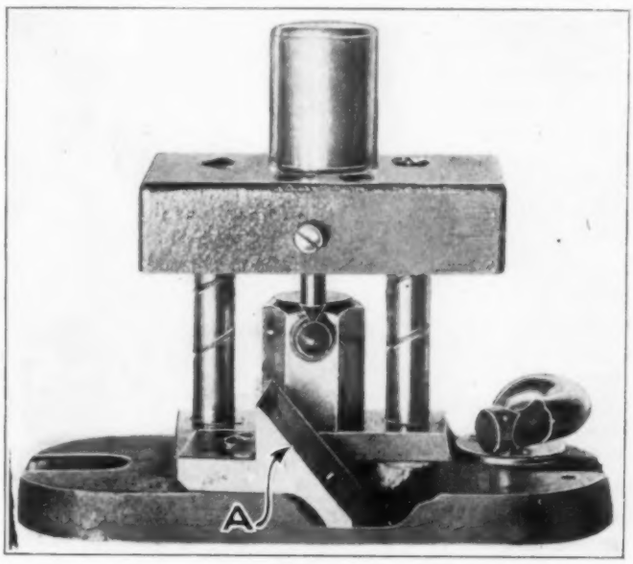


FIG. 14. TOOLS FOR PIERCING A BURRED HOLE

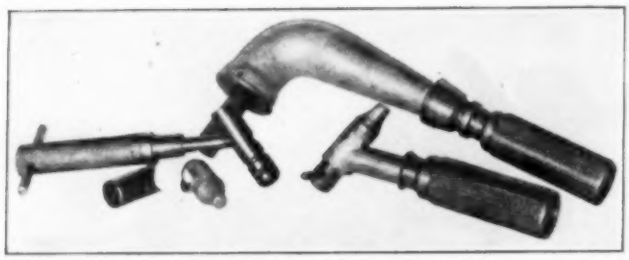


FIG. 15. ASSEMBLY FIXTURES

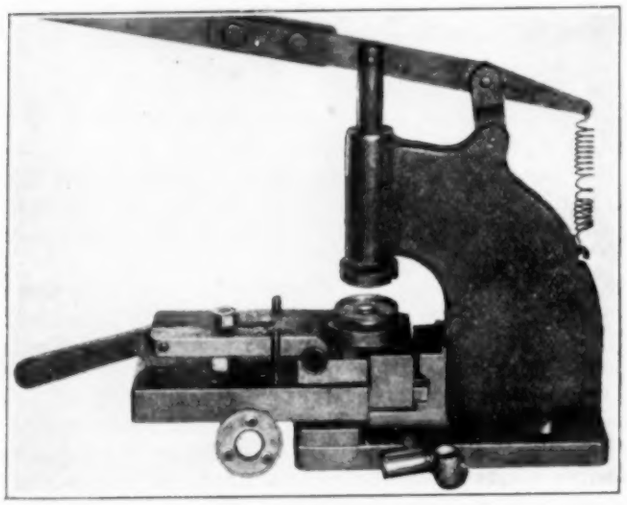


FIG. 16. AN ASSEMBLY PRESS

be seen in Fig. 13, while on each side are the tools for doing the work. Since the hole covers more than half of the circumference of the tube the work must necessarily be done in two operations. The tube is placed over the horn *B* of the fixture at the right with the flange in contact with pins *C* and one-half of the opening punched. It is then placed over the horn in the fixture at the left with the flange resting on pin *D* and the other half of the opening punched, the position of the completed opening bearing a certain angular relation to that of the flange. A small hole near the extreme end has to be tapped but the metal is too thin to allow the forming of a satisfactory thread. The tube is placed over the horn of the pillar tools shown in Fig. 14, and located by bringing the flange in contact with the angular block *A*. The punch has a point similar to that of a lathe center and simply forces its way through the metal leaving quite a burr on the inside. In tapping, the inside edges of this burr take the thread and answer the purpose of a thicker wall in the tube. In assembling parts that are soldered together fixtures are used to hold them in proper relative positions while the solder is being applied. Two such fixtures with the work in place are illustrated in Fig. 15, the upper one being for the tone arm while the lower one is for the barrel joint. An empty fixture for the latter is shown at the left and the parts it is to hold are directly beneath it.

FIG. 17. GAGE FOR TESTING CORRECTNESS OF ASSEMBLY

The sound-box elbow and flange are assembled in a hand press, as may be seen in Fig. 16. Here the elbow is held in a matrix with the end to receive the flange pointing upward. The flange is put in place by hand and forced on by the press. As soon as the solder is applied the ram of the press is again brought down holding the parts firmly in position until the solder sets. In the finished assembly the position of the flange must bear a certain relation to the small hole to be tapped and previously referred to. The gage for determining the correctness of the assembly is shown in Fig. 17. Here one end of the elbow is held within the sleeve *A* with the pin *B* in the small hole. If the assembly is correct the flange will bear evenly on the angular block *C*.

Marking Tools by Etching

BY A. T. SMITH

On page 1047, Vol. 53, of *American Machinist*, a very clear description of a method of marking steel tools by etching is given. However, I suggest the following simple, harmless and effective method for accomplishing the same result:

Make a saturated solution of approximately equal parts of copper sulphate and ordinary table salt, in water. The article to be marked is coated evenly with toilet soap, simply by rubbing with a cake of soap. The desired marking is then drawn through the soap coating with a scriber or other sharp point. The marking is covered with a few drops of the solution, no dam being required. The solution will pile up on the soap, an effect caused by the chemical re-action. Let it stand two or three minutes until the markings show quite red and then rub off with oily waste. The writer marked several tools by this method twenty years ago, and the marking is now as clear and sharp as when made.

Substitute for Thumbtacks

BY F. L. SYLVESTER

We have almost discontinued the use of thumbtacks in our shop. Our method is first to cover the drawing board with heavy Manila drawing paper stretched on by wetting it and then gluing it on by the edges all around, keeping the middle moist by laying a dampened cloth on it until the glue has had time to set. When this has dried out, it gives a smooth surface which will not pucker or wrinkle under varying weather conditions. Onto this we stick our drawing paper, whether large or small, with white library or photo paste, applying it in spots 8 to 10 in. apart along the edges.

This holds the paper well enough for doing the drawing but not so that it cannot be removed without tearing after the work is done. This method might not be feasible with tracing cloth which, of course, would be used if much blueprinting were done, but our work is mostly done either on light brown paper or thin white sketching paper. For the few blueprints we do require we make the drawing on the paper direct.

Details of Large Airplane Work

Fixtures Used in Wing Construction—Increasing Application of Metal Framing—Installing Motors in Planes—Methods of Assembling Fuselages

SPECIAL CORRESPONDENCE

SOME idea of the progress which has been made in the commercial construction of airplanes is shown in the accompanying illustrations. Those who recall the early heavier-than-air machines, cannot fail to notice a marked difference in the details of construction of the various members and the more workmanlike manner in which they are put together. Fig. 1 shows the latest fixture for building up wing ribs, it being an improvement over some of the fixtures previously illustrated. This fixture is largely of metal, the outside edge *A* showing the construction of the complete boundary around the outer surfaces of the ribs. The strip forming the boundary projects sufficiently above the space on which the rib members are laid, to hold the upper and lower strips in their proper positions while the intermediate braces and cross members are being put in place. The outer strips are put in place and the inner members assembled as shown.

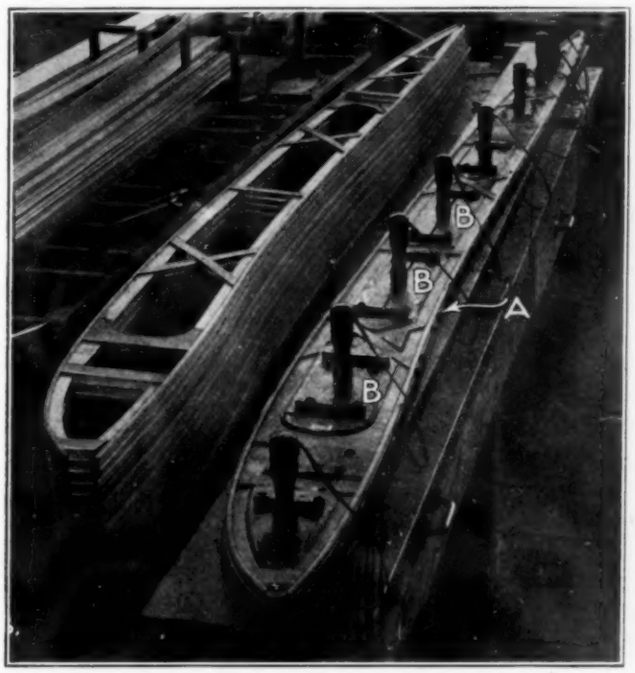


FIG. 1. A MODERN RIB FIXTURE

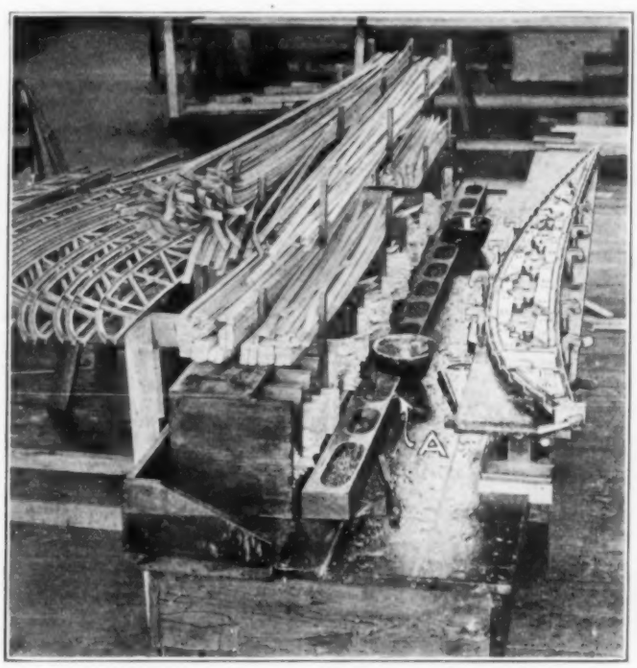


FIG. 2. ANOTHER TYPE OF RIB FIXTURE

Nine Pairs of Wedging Blocks

There are nine pairs of wedging blocks *B*, each pair being forced into its extreme or outer position by means of the taper pins shown. A light strap is attached to each pin, in reality it is a piece of belt lacing and keeps every pin within easy reach of the operator. With the upper and lower members of the rib forced against the outer portions of the fixture, the cross-members and other pieces in their braces are placed in position and fastened firmly in place by both gluing and nailing. It will be noted that there are suitable openings or notches provided in the outer edge of the fixture to allow small nails or brads to be easily driven into position.

Another type of fixture is shown in Fig. 2, the rib in this case being of an entirely different contour, as can be seen. The outer edges of the fixture are very similar to those shown in Fig. 1, but a different method is used for forcing the upper and lower members into position against the outer frame of the fixture. In this case the wedges are controlled by cams actuated by the handles shown on the outside. This illustration also shows the convenient way in which the various sizes of small nails or brads are kept, as at *A*. Both Figs. 1 and 2 give a very good idea of the way in which the work is handled.

In Fig. 3 is shown a complete unit for wing ribs, mounted on an independent bench and shows how two men can easily work on the same rib without interference. This incidentally, gives a good idea of the size of the ribs themselves.

The growth in the use of metal framing, even where fabric is used for the wings, is shown in Fig. 4. This view shows a complete elevator frame and two rudder frames ready to be covered, the frames being entirely of metal; mostly steel tubing with the joints brazed or soldered.

Handling Liberty Motors

Figs. 5 and 6 show a convenient method of handling the Liberty motors, lifting them from the floor and placing them on the engine bed in the plane. Fig. 5 shows how the engine is mounted on a base or subframe and also the way in which it is swung from

FIG. 3. A RIB MAKING BENCH

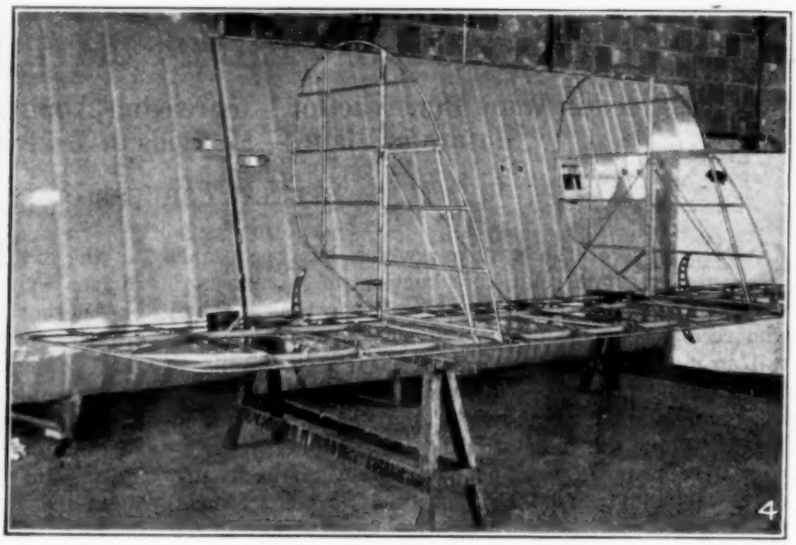


FIG. 4. STEEL TAIL FRAMING

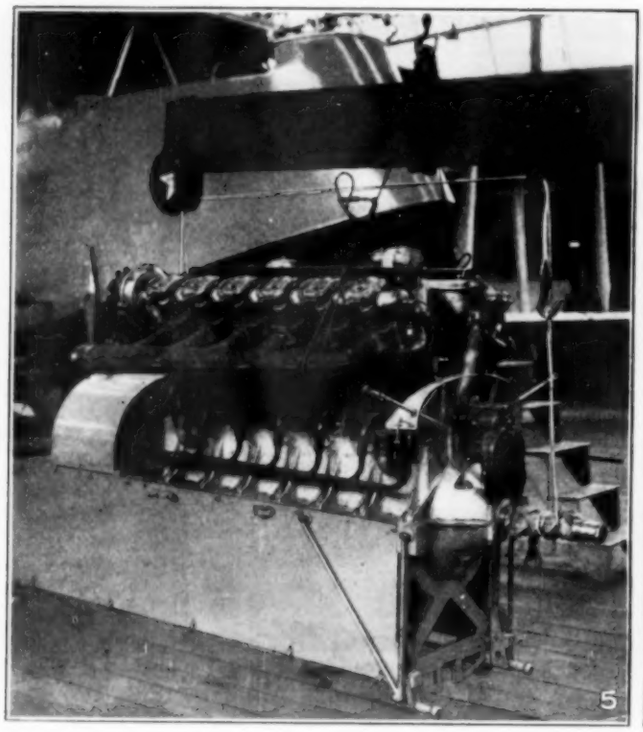


FIG. 5. SLINGING THE MOTOR

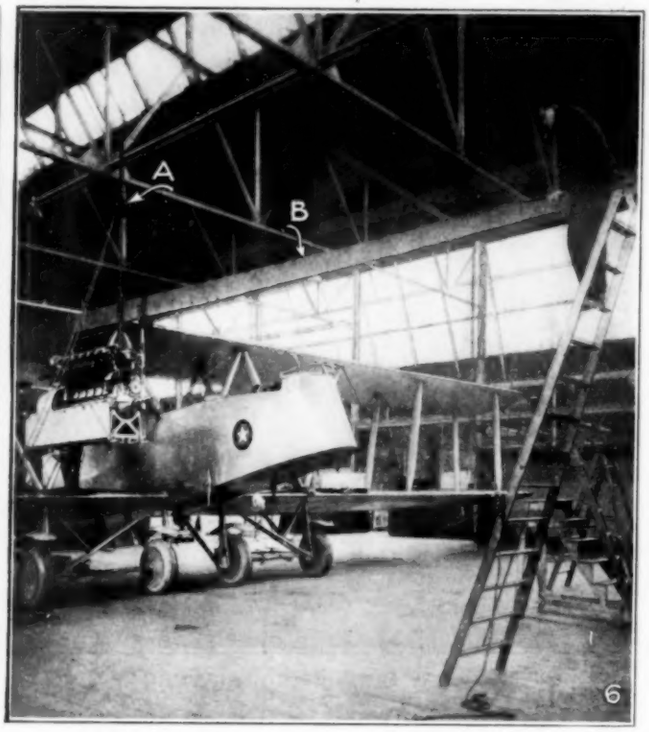


FIG. 6. SWINGING THE MOTOR INTO PLACE

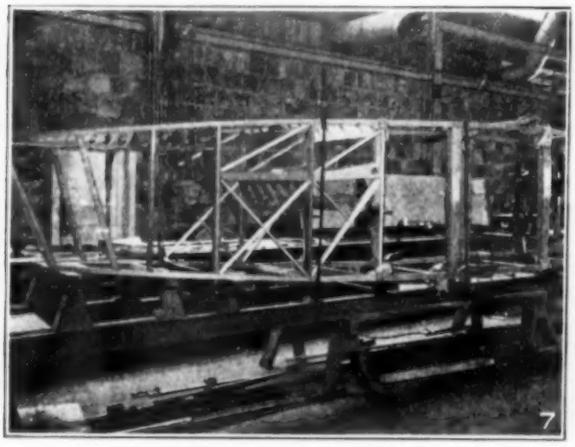


FIG. 7. BUILDING UP THE FUSELAGE

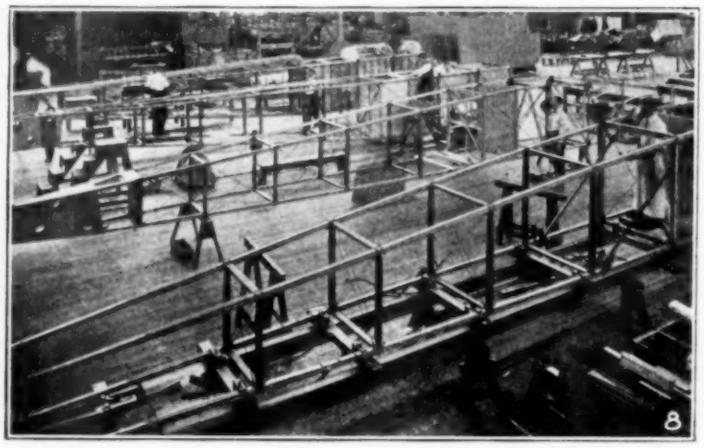


FIG. 8. FOUR STAGES OF COMPLETION

the overhead beam. The rope from the beam to the exhaust manifolds is simply to prevent any tendency of the engine to turn over.

Fig. 6 shows how the engine is lifted by the hoist at *A* and then swung into position by means of the long beam *B*, which is handled by the man on the step-ladder, assisted by the two men shown behind the engine on the lower plane. This combination has been found to work out very satisfactorily as traveling cranes are not available. It must be remembered that these engines are 400 hp., and each weighs, with its base, between 800 and 1,000 lb.

Assembling

The remaining illustrations, Figs. 7 and 8, show two views of the floor where the fuselages are erected. The assembling is done on the rails or erection platform, shown in Fig. 7 and in the foreground in Fig. 8. These platforms are composed of steel I-beams, mounted on substantial horses.

After the skeleton of the fuselage is assembled the four longerons are tied together by the vertical and horizontal braces and the cross wires. Then the assembly moves up the line as it is now only necessary to support the fuselage at two points as can be seen in the plane next to the one in the foreground.

As improved airplane construction is developed, it becomes more and more of a real machine and in consequence requires more and more machine equipment for its manufacture. For this reason, if for no other, it behooves machine builders to watch and to encourage the development of the airplane industry.

Should Jigs and Fixtures Be "Designed"?

By H. W. Armstrong

On page 26, Vol. 54, of the *American Machinist* P. A. Fredericks brings up the question for discussion as to whether it pays to design jigs and fixtures in the drafting room, or to have the toolmaker design these to fit the job on hand.

The writer, whose experience has been gained with about fifteen concerns in various parts of the country [some of these being small jobbing and manufacturing plants, while others were of national importance], would like to take part in this discussion. My experience covering such positions as machinist, toolmaker, draftsman, chief tool designer, master mechanic and superintendent should qualify me to express a fair opinion.

As Mr. Fredericks states, it may be largely a question of personnel. Undoubtedly any shop which has been using either of these methods would flounder around for awhile if the method in use was suddenly changed. However, it has been my experience that the shops in which the tools were designed in the drafting room were the ones which were most up to date and profitable. It is quite true that there are still a number of shops which do not use this method but I feel sure they are in the minority.

Advantage of a Designing Department

The advantages which a shop with a designing department has are many. First, it must be remembered that good all-around mechanics are scarce. That is, it is easier to find lathe hands, milling machine hands, etc., than good all-around toolmakers. If a fixture is designed the work can be laid out so that each specialist does his work, leaving the assembling and final work for the good toolmaker. Again, in a shop where the toolmaker starts and finishes the job himself it is not always possible to obtain a machine when he wants it, so that some of his time may not be spent profitably as the bench work cannot always be depended on to keep him busy unless he has a number of jobs at the same time, which causes the work to get more or less mixed up.

Another advantage is that the stock can be cut off to the blueprints by a cheaper man and the parts are all ready to go ahead on schedule when required. This results in very little lost time after the job is once started. Also it allows the work to be routed so that each tool or fixture is ready when needed.

The System Demonstrated

The best demonstration of this system that I know of is the plant of the Pratt & Whitney Co. at Hartford, Conn.

The jigs and fixtures are designed by the drafting department. The stock is then cut off in the stock department and each job in a separate pan is sent to the tool department. There it is turned over to the bench foreman, who has the work laid out and the lathe work, shaper work, milling work, etc., is taken care of by the straw boss or foreman in charge of each section. When all machining has been done the finished parts are returned to the bench foreman for assembling.

Everything considered, this method, in the writer's opinion, is the better. It can be used to advantage in a smaller way by the small shop. Of course it is absolutely nesessary that the shop foreman should have some say in the design of the tools and he should O. K. everything before allowing the work to go through into the shop. This gives the draftsman, who has not always had the benefit of shop experience, the advantage of the foreman's practical knowledge. Also it eliminates antagonizing the foreman, who is not always in sympathy with the designs thrust upon him, without his consent, by the drafting department. This insures the co-operation of the shop and drafting room, which is a matter of vital importance.

It must be remembered also that when drawings are made there is always a permanent record of the job for reference when such a job comes up again. When the toolmaker works to his own design without drawings or with incomplete sketches the whole job has to be done all over again next time.

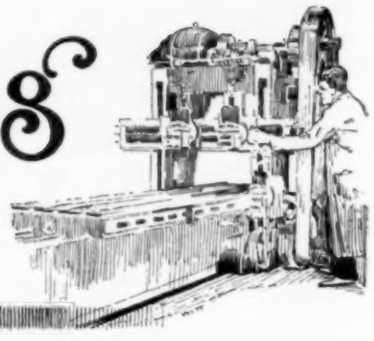
Drawings May Not Pay in Jobbing Shop

It may be that in the jobbing shop, where almost every job is different, it would not pay to make drawings, but these shops generally have only all-around toolmakers and machinists in their employ and these men can generally be trusted to do the proper thing. The larger shops cannot always get all the good mechanics they require, especially in rush times, so that it is usually necessary to specialize, thus requiring a drafting department. Also these specialists usually do the machine work much faster than the average toolmaker, as they have all necessary tools at hand and usually have a better knowledge of machine work, which is proper, as they do nothing else.

Therefore, in the opinion of the writer, it is better to have the tools designed, except perhaps in some few special cases.

Metal Cutting Tools.

By A. L. DeLeeuw



V. Boring Tools in General

The Three Operations Included in the General Term Boring—Various Arrangements of Tools and Work—Types of Boring Tools

BORING, in its narrower meaning, is the enlarging of a hole by means of a cutting tool and includes reaming as well as what is ordinarily called boring. There are, therefore, three meanings of the word boring. One is the making of a hole, which may require drilling as well as other operations. The second meaning is the enlarging of a hole, and may include reaming. The third and narrower meaning does not include reaming. The essential difference between boring and reaming lies in the difference in the tool used, and not in the nature of the operation.

We will first confine ourselves to boring in the narrower sense of the word. In that sense boring may be called inside turning. In fact it is often called just that, when, for instance, a large flywheel has to be turned at the inside of its rim. Such an operation is in no way different from the boring of a small hole, except in regard to some details. The most important fact to be kept in mind about boring or inside turning is that the tool is presented to the inside of a cylinder

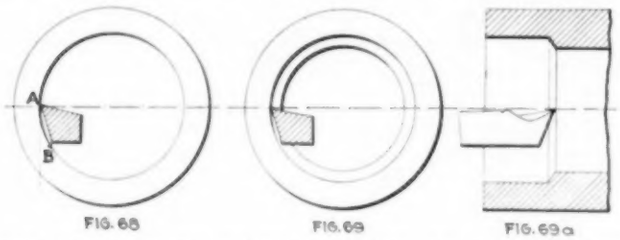


FIG. 68. POSITION OF BORING TOOL IN SMALL WORK
FIG. 69. VIEW SHOWING ANALOGY TO TURNING CUT
FIG. 69a. SIDE VIEW SHOWING FRONT CLEARANCE

instead of to the outside, and that, as a consequence, there are new relations between the angles of the tool and the surface to be finished. In Fig. 68 a tool is shown in position boring out a hole in a relatively small piece. The first thing that strikes our eye is the necessity of having a large clearance angle. If the clearance angle had been made smaller the corner *B* of the tool would have struck the finished work. In Fig. 69 this same tool is shown in the same piece, and a section of the piece, Fig. 69a, shows that the cutting takes place in practically the same way in which the turning cut proceeds; that is, a large percentage of the cut is in the direction of the feed. Just as with turning this is true for most roughing cuts, and again, as with turning, the greater part of the cut takes place by the rotation of the work if a finishing cut is taken. There is, however, one great difference. In turning, the tool was presented to the work at right angles to the axis; in boring, it is presented parallel to the axis, or nearly so. As a result the front clearance of a boring tool corresponds to the side clearance of a turning tool, and the side clearance of a boring tool corresponds to the front clearance of a turning tool. It has been remarked that the side clearance of a turning tool should be greater than the front clearance, as the tool has to do both cutting and penetrating. For the same reason, then, the front clearance of a boring tool must be somewhat greater than the front clearance of a turning tool. We might expect that the side clearance of a boring tool would be the same as the front clearance of a turning tool, but this is not so for the reason shown in Fig. 68.

All the above considerations show that a boring tool is of necessity weaker at its cutting points than a corresponding turning tool, and this weakness becomes more emphasized as the hole to be bored is smaller.

We have noticed the effects of setting a tool above or below the center when turning. There is a similar effect when boring except that in this case the rake is diminished by setting it above the center while the clearance is diminished by setting it below the center.

In a great many cases it is not practicable to support the boring tool except at one end, so that the effects of overhang are much more serious than with turning tools. There is both twisting and bending present. The bending has the tendency to reduce clearance and to increase the rake and as an excessive rake may cause the tool to pull itself into the work, it is necessary to make long overhanging boring tools with a very small amount of rake. This increases the power required to take certain cuts, and this in its turn increases the amount of bending, so that altogether it would not be practical to take heavy boring cuts with a long overhanging tool. The effect of twisting is not so serious except in so far that it increases the vibrations. Where heavy cuts must be taken the overhanging tool should not be used, but in its place should be used a tool which can be supported at both ends. All modern boring practice depends on this principle.

Boring is done by either revolving the piece or revolving the tool, and no distinctive names are given to these two operations. When the tool is overhung and the work revolves while the work feeds, we have poor conditions for taking heavy cuts. On the other

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hand the strains in the boring tool remain always the same so long as the cut remains the same, and consequently we will obtain a uniform hole. If the work revolves we will get an axis of the hole coinciding with the axis of the spindle. If the direction of the feed is parallel with the direction of the axis of the spindle we will get a straight hole. If it is not we will get a taper hole. But in any case we will get a hole in the proper direction, and round.

If the tool is overhung and revolving while it also feeds, we will get a hole in the direction of the feed but not in the direction of the axis of the spindle. We will, however, get a true hole so long as the cut is uniform. It may be remarked here that it is highly improbable that we would have a uniform cut and for this reason it is customary to take a number of cuts in order to get the last cut practically uniform. If, for instance, the first cut would be such that we have to remove $\frac{1}{8}$ in. more on one side of the hole than on the other, then the tool will spring, let us say, 0.010 in. and the resulting hole will be that much out of true. If we now take a second cut, the tool would still spring, but not nearly so much as before, and the resulting hole will be only 0.001 in. out of true. A third cut would probably be so nearly true that the error is not measurable.

However many cuts are taken it is good practice to allow a fair amount of metal to be removed by the last cut. Suppose the hole were round within 0.002 in., and suppose we had left only 0.004 in. to be removed by the last cut, then we would have to remove 0.003 in. on one side, and with only 0.001 in. on the other side of the hole, or a ratio of 3 to 1, and the probable result would be that, after taking the last cut, the hole is still out of true, say 0.001 in. It might even be if the tool is not entirely sharp, that the small amount of 0.001 in. which was left on one side of the hole will not be cut away at all, and that, as the machinist sets his tool by trial, he may have to bore out 0.004 in. on the thick side in order to enlarge the hole 0.003 in. Thus again the hole will be out of true 0.002 in., but this time the eccentricity will be toward the left instead of the right.

If, on the other hand, we had allowed 0.010 in. to be bored out on the last cut, the amount of metal to be

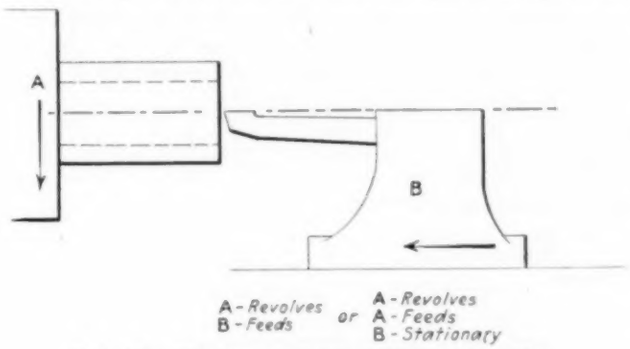


FIG. 70. BORING SET-UP, WORK CHUCKED

removed would have been 0.006 in. on one side and 0.004 in. on the other, allowing the tool to take a cut all around and making a hole very nearly true.

If the tool revolves while the work feeds the result will be the same as if the tool were feeding.

If the tool is held in a bar which is not supported, then all conditions are, of course, the same as with an overhanging tool, but if the bar is supported, a number of new conditions may arise. Such a bar would have two supports: It would be gripped at one end, and merely guided at the other. It may revolve, or it may be stationary. The guided part of the bar may be on the same side of the work as the gripped end, or it may be on the other side, or it may be in the work. The guided end may find its bearing in a revolving spindle, or in a stationary part, and the result will

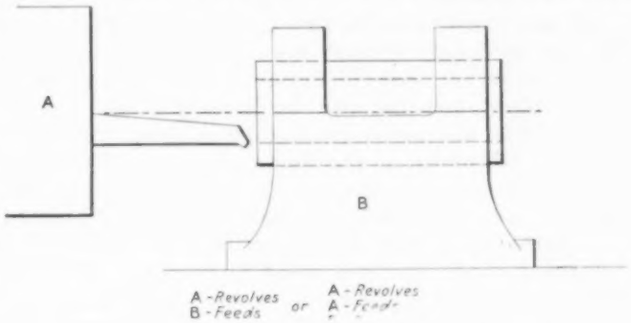


FIG. 71. BORING SET-UP, TOOL REVOLVING

be more or less modified according to which of these various conditions is before us.

The accuracy of the hole obtained by boring depends not only on the accuracy of the machine but also on the arrangement of tool and work. It may be taken for granted that there is always some looseness in the spindle, some looseness in the machine element which feeds, be it spindle or carriage, and that the direction of the feed is not absolutely the same as the direction of the axis of the spindle. But apart from these inaccuracies there are other causes which make the hole more or less faulty, either in direction or roundness or size or straightness.

Fig. 70 shows a piece of work which revolves as it is being bored out by a tool which is clamped in a holder, the holder being provided with feed movement. It is an arrangement such as might be found when we bore a piece by clamping it to the faceplate of a lathe, and holding a single point boring tool clamped in the carriage. Such an arrangement will produce a hole of which the axis is the axis of rotation of the spindle. If the spindle should be loose, then the axis of the hole will not be a straight line, otherwise it will. If the direction of the feed is parallel with the direction of the axis of rotation the hole will be cylindrical. Otherwise it will be more or less taper. If more than one boring cut is taken, so that in the last cut a practically uniform amount of metal is removed all around the hole, then the deflection and twist of the tool will be the same through the entire length of the hole, so that the size of the hole will be uniform.

The same results would be had if the element *A* were both revolving and feeding, and if *B* were stationary. This feeding may take place by feeding the entire head in which the work is held, or the spindle with its sleeve alone may be fed forward. In either case, the same results are obtained as before.

In Fig. 71 conditions are reversed: The tool is held in the revolving member, and the work in the fixture. This arrangement will give a hole of uniform size, but the axis of the hole will be parallel with the direction of the feed so that it will be extremely difficult to determine in advance the direction of the hole. It would only be possible to bore several holes with parallel axes, if one could depend with absolute certainty on

the accuracy of the fixture and the feed. The same results would be obtained if the tool had both revolving and feeding motion, and the work were held stationary.

In Fig. 72 the work is shown held in a fixture, and a boring bar is attached to the revolving member. The end of the boring bar is supported in a rest. If the bar revolves and the work holder feeds while the support for the end of the bar is stationary, the following may be expected:

We may expect that the axis of rotation of the spindle does not go exactly through the center of the stationary bar support, so that in revolving the bar must be slightly bent and the tool describes a circle slightly greater than one would measure by calipering over tool and bar. However, as the position of the cutting point of the tool does not change during the operation, this has no bad effect on the hole. We would naturally not measure the hole by calipering the tool, but by calipering the finished hole itself. The result will therefore be this: We will obtain a hole of uniform size, of which the direction of the axis is the direction of the feed.

The second condition shown in Fig. 72 would lead to poor results because it cannot be expected that the axis

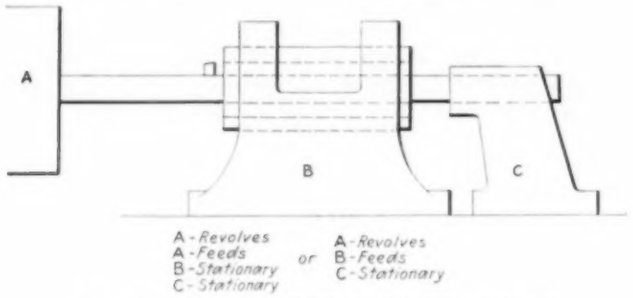


FIG. 72. BORING SET-UP, BORING BAR WITH OUTSIDE REST

of rotation of the piece A absolutely coincides with the center of the rest C. This would cause bending, but as the tool gradually approaches C, the amount of bending would gradually become less and the hole would not be of uniform size. Furthermore, as the hole in C may not be entirely in line with the direction of the feed, the axis of the hole in the work would become a curved line so that the total result would be a bell-mouthed hole with a curved axis.

If, in Fig. 72, feed were given to B instead of to A, conditions would be different again. As the tool bar between faceplate and rest would always be of the same length, the amount of deflection will be the same at any point of the hole so that the hole will be of uniform size. But as C may not be in line with A the axis of the hole will be neither the direction of the boring bar nor the direction of the feed, nor that of the axis of the spindle, but a straight line somewhere between these three directions.

In Fig. 73 the boring bar is supposed to be clamped to the carriage B, and the work to the revolving spindle. The boring bar is guided in the spindle. We find such a condition, for instance, in the Potter & Johnson automatic chucking lathe and in a number of other machines. As the length of bar between carriage and guide becomes shorter as we progress with the boring, the deflection of the tool must be a variable amount so that the hole will not be of uniform size. If B is not in line with the spindle the position of the tool point will be governed by the curved line which the axis of the bar assumes under the stress of bending. This curved line will be different according to the distance between tool point and spindle, so that not only will the hole be of uneven size, but its axis will be a curved line, and this curved line will be still further affected by the fact that the direction of the feed is probably not the same as the axis of rotation. This method of boring would not be acceptable at all if it were not for the fact that all the elements mentioned above may be kept small in a well-built and well-maintained machine, and if it were not that this method permits of very much heavier cuts than when the boring bar is overhung. It is, therefore, a useful method when the machine is in good condition, when heavy cuts must be taken and when no extreme accuracy is required.

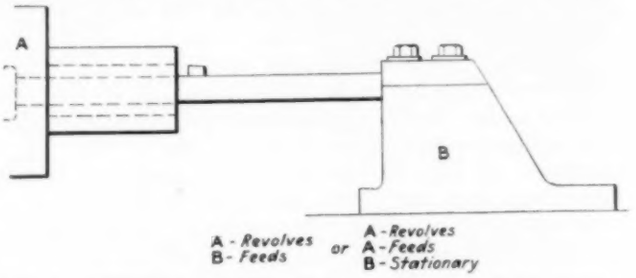


FIG. 73. BORING SET-UP, BORING BAR PILOTED IN CHUCK

Fig. 73 also applies if the work revolves and feeds, and if the bar is stationary. All the above considerations can also be applied in this case.

Fig. 74 shows a condition which should never be tolerated but which is found in a good many cases. In this arrangement the bar revolves and feeds (as for instance in a drill press), and a fixed rest or jig-eye C is provided. Such an arrangement is useful for drilling, but of very little or no use for boring. In the first case possible with the arrangement of Fig. 74, the spindle revolves and feeds, the tool is held in an overhanging bar and the amount of overhang changes as feeding progresses so that the deflection is constantly changing. This amount of deflection is necessarily great. The result will be a hole much larger on the left than on the right. Then, too, the piece C acts as a guide at the beginning of the operation but has very little effect when the tool is further down in the hole. Consequently the axis of the hole will be very largely controlled by the amount of metal to be removed, by the homogeneity of the metal and by other conditions over which the machinist has no control. In addition the facts that the direction of rotation may differ from the direction of the feed and that the spindle may not line up with piece C will further affect the accuracy of the hole. The reason why such an arrange-

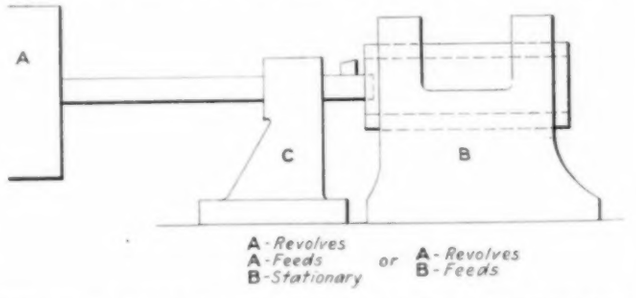


FIG. 74. BORING SET-UP, BORING BAR WITH INSIDE REST

ment may be tolerated for drilling is that the drill cannot be guided except for the beginning of the hole and this arrangement will do that much. After the drill has once entered it will be guided entirely by the peculiarities of the metal and the grinding of the drill. Under ordinary conditions a hole will be produced by the drill sufficiently accurate for a mere drilled hole. Briefly, this arrangement is all right for drilling because we do not expect a drilled hole to be accurate, but this does not apply to boring.

If, in the arrangement of Fig. 74, *A* should revolve and *B* should feed, the distance between *B* and *C* would have to be much greater than shown in the sketch and the results would be even less satisfactory. However, such an arrangement is not ordinarily used.

In Fig. 75 is shown an arrangement which is quite commonly used in manufacturing. The boring bar is guided in two rests, C_1 and C_2, and is driven by universal joints or equalizing drivers from some revolving member. In this case, the axis of rotation is the common center line at C_1 and C_2. If the bar revolves and also feeds while the work is stationary, a hole may be generated of which the axis is the common center line of

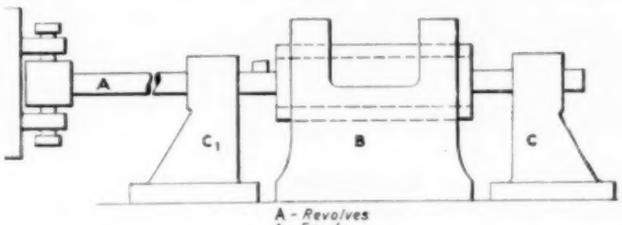


FIG. 75. BORING SET-UP, BORING BAR GUIDED BY TWO RESTS AND DRIVEN BY UNIVERSAL JOINT

C_1 and C_2. This shows that it is very necessary that C_1 and C_2 should be in true alignment. Any variation from such alignment would cause the bar to bend and assume the form of an elongated letter *S*, so that the axis of the hole would also have this form. Besides this defect, which is only present when C_1 and C_2 are not properly lined up, there is another factor which distorts the hole. The amount of deflection of the bar, due to the pressure of the cut, is very small when the tool is near C_1; it gradually gets larger until the tool reaches the center of its travel, after which the deflection diminishes again and becomes once more a minimum at the end of the hole, so that, even with true alignment of the rests C_1 and C_2, a hole will be generated which is larger in diameter at both ends than at the center. In the foregoing it was assumed that the looseness of the universal joint is sufficient to make up for whatever difference there may be between the feed and the center line of the bar. If this were not so, the bar would be cramped and would bend at some point of its travel. The bending would take place, primarily, near the universal joint, but it would also cause a certain amount of bending between the two rests. It is, therefore, important that such an arrangement should be made with sufficient looseness at the driving end. Sometimes the drive is so arranged that it is free in one plane but cramps in the other so that there is no bending when the tool is standing up and down, but there is some bending when the tool is standing horizontally. This fault would lead to a hole which is out of round at that portion of the bore where the bar was partially cramped.

The general arrangement of Fig. 75 may be modified by having the bar revolving only, while the work feeds as shown in Fig. 76. In this case, sufficient room must be provided between the rests C_1 and C_2 to accommodate at least twice the length of the hole to be bored. The tool will be in the center between the two rests, and, as it maintains its position in relation to the supports

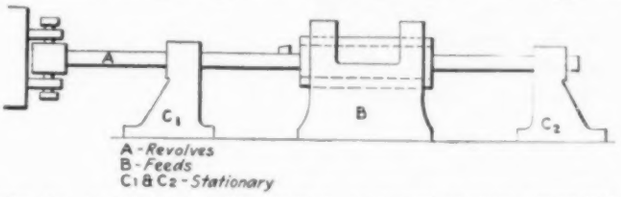


FIG. 76. MODIFICATION OF FIG. 75 WITH WORK FEEDING

for the bar, the amount of deflection will always be the same at any point of the bore. If the rests are properly lined up a hole will be generated with a straight axis and of uniform size. The direction of the axis, however, will be the same as the direction of the feed.

If the two rests are not in true alignment the bar will assume the shape of the elongated S as before, but as the tool is always located in the same relation to its supports this distortion of the bar does not affect the hole. If the bar is cramped at the universal joint there may be some deflection of the tool point when it is in a vertical position, and no deflection or a different amount of deflection, when it is in a horizontal position, and this will cause the hole to be out of round. Under these conditions, then, we will have a hole with a straight axis, of uniform section, but not round. The axis will be the direction of the feed as was mentioned before.

Fig. 77 shows the same arrangements as Fig. 75, except that now the two rests C_1 and C_2 are built in one with the work-holder *B*. If, with this arrangement, the tool rotates and also feeds, we will have exactly the same conditions as with Fig. 75. If the tool revolves, but the work feeds, we will have the same conditions as in Fig. 76, except that the bar will be shorter between supports, that consequently the deflection will be less, and that the deflection will not be uniform but will vary as in Fig. 75. The effect of cramping the bar also works the same as in Fig. 75.

The arrangement of Fig. 72 is sometimes reversed; that is, the elements *B* and *C* will rotate, whereas *A* is stationary. This is done when a fixture is fastened to the faceplate of a lathe. In that case it is always the tool that feeds. This arrangement is in all essentials the same as the arrangement shown in Fig. 73,

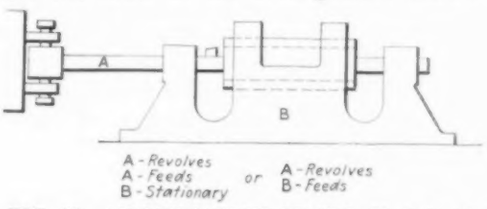


FIG. 77. MODIFICATION OF FIG. 75, RESTS INTEGRAL WITH WORK SUPPORT

with the exception that there is less assurance that the support *C* will line up with the spindle than with the arrangement of Fig. 73.

The arrangement of Fig. 74 may also be reversed by clamping *B* and *C* to a fixture on the faceplate of a lathe. If in such an arrangement *B* and *C* are both properly lined up with the spindle, the hole will have

an axis which coincides with the axis of rotation but as the amount of deflection varies from one end of the hole to the other, the hole will be tapered with the large end toward *C*. In an arrangement of this kind it is naturally *A* which feeds, and the direction of the feed may be different from the direction of rotation. But this would not affect the elements of the hole, provided that the bar fits closely enough in *C*, and provided that the length of the bearing in *C* is great enough so that whatever bending there may be in the bar will all take place between *A* and *C*.

If *B* and *C* are not in true alignment with the spindle we will have to deal with other conditions. If *B* and *C* are in alignment with each other but not with the spindle, we will have the same conditions as before except that the hole will not be bored in the same relation to the outside of the work as if the true alignment existed. In other words, the hole would be eccentric with the outside. The entire bar describes a small circle around the true center of rotation, with the exception of that part of the bar which is clamped in *A*.

If *B* is in true alignment with the spindle but *C* is not, and if we suppose that the center line of *C* is parallel with that of *B*, then the only thing which will be affected will be the size of the hole, but if the center line of *C* is not parallel with that of *B*, then a taper hole will be generated of which the small end is toward *C*. As the deflection of the bar itself would cause the small end to be at the other extreme of the work, the two conditions combined, that is, the deflection of the bar and the faulty alignment of *C*, may cause a barrel-shaped hole, larger in the center than at the two ends.

If both *B* and *C* are out of alignment with the spindle and also out of line with each other, there will be a combination of the faults mentioned in the previous two paragraphs. In this case the hole may be eccentric with the outside, the eccentricity may be different at the two ends of the work, and the hole may be taper or barrel-shaped. But in all cases the axis of the hole will be a straight line and will coincide with the axis of rotation.

(To be continued next week.)

Industrial Research in the Art of Man Management

The Executive's Policies Must Be Built Upon Experience — Each Plant Should Develop Its Own Standards — All Executives Must Contribute to Administrative Research

BY ERWIN H. SCHELL

THE technique of administration has long been shrouded in vagueness and mystery. The man of "magnetism," of "power," of "influence" has been viewed with acclaim through the undiscerning eyes of the hero worshiper and the loyal henchman who follows and finds an innate satisfaction in that following. Today finds technical ability and skill in the scientific method of approach given second place in the scale of importance with which human value is measured in industry. The handling of men, leadership, the art of authority, is the greatest of all human assets in modern organizations.

The successful executive who has been reared under the influences of the American industrial regime has invariably been an exponent of the strenuous life. The onrush of economic progress has constantly besieged him with insistent problems demanding immediate decisions. He has been steadily facing a stream of changing conditions, the result of economic stresses of which he has little conception. He must, therefore, build his policies on experience rather than logic. His success is measured by his ability to profit by his errors. His conclusions in many cases will be far more influenced by his intuitions than by his reasoning, and he will often be observed, when questioned concerning the cause of his action, searching for reasons in support of a judgment which is founded upon the intuitive reaction of experience.

STANDARDS OF ADMINISTRATION NEEDED

This path of individual progress, while slow and costly, has been effective in many cases. In our manufacturing plants today there are many administrators who approach their personal problems of man management with a praiseworthy skill. It is to these men that education must turn for the acquiring of data with which to teach the coming generation. Industry must continue to profit from their experience through its transfer to their successors. The chief responsibility of every establishment is to raise the common level of administrative skill in the executive organization to the standards of their most successful leaders, to make the most effective technique of man management available for the use of all. In short, each plant should develop its own standards of administrative procedure. This is a work of the utmost seriousness. It asks the best collective thought of the executive group. The outside specialist has no place in this activity. It is a problem for the interior organization which is responsible for operation. Its solution becomes an intimate part of the industry's craft knowledge and should be considered as bearing the same relationship to the economic progress of the concern as its special formulas or processes.

NATURE OF WORK SHOULD BE UNDERSTOOD

In approaching this task it is most important that the exact nature of the work to be done should be thoroughly understood by those who are called upon to co-operate. The initial activity is essentially one of research, which in turn will have an educational value. Therefore each participant should view the proposed program of investigation in the light of his opportunity to contribute the fruits of his experience in the handling of men, so that from the resulting summation of data a procedure may be developed which will

incorporate the best ideas of the entire executive group, and may therefore be considered in the light of a standard. When members of an administrative organization are called together to consider such a program they are prone to view it in the light of a form of camouflaged education, and thereupon assume a receptive attitude and prepare to be taught. This attitude will not yield the desired result, and therefore at the outset each executive should be shown his responsibilities as a member of the research team, and strong emphasis should be placed upon the fact that his value in the work will be measured in direct proportion to his willingness to contribute of his own experience and methods.

"Book of Administration"

It should be made clear to each member that he has been appointed to serve as an associate author in the development of a "Book of Administration" for the factory, that his contributions in the research work will be received on a parity of importance with those of the other members, irrespective of his position in the administrative organization, and that the data thus presented will not influence in any way his executive standing. He should appreciate that an idea, while not intrinsically of value, may suggest a way to a most important conclusion, and therefore that his willingness to speak freely and frankly is as much to be commended as the number of his concepts which find their way into the final record.

Any condition which will tend in the smallest way to hamper the expression of ideas by the members of the group must be completely eliminated if the work is to be effectively carried out. Collective thought of a constructive sort is best accomplished when the persons participating do not hesitate to "think out loud." This procedure gives the entire group opportunity to reflect upon the initial conception and is much more efficient in making progress along a certain line of reasoning than is the case when the individual delays expression until he can protect his statements by suitable arguments, and verify the soundness of his ideas before giving others the opportunity.

An essential characteristic of the research conferences which distinguishes them from the usual gathering of this sort is that the flow of information will be from the conferees toward the chairman of the meeting, rather than in the opposite direction. The chairman should, therefore, be most careful to avoid the expression of personal opinions or ideas which will give the impression that he is trying to influence the group. His task is solely the assembling of data and his success will depend upon his ability to extract the necessary information from the other members of the conference.

In some cases this may be accomplished best through obtaining the criticisms of the group to hypothetical methods or procedures, or the use of concrete examples for discussion. Such technique demands that the chairman be well versed in the scope of the research which is being undertaken and have a clear sense of the boundaries of the inquiry—of the ground to be covered—so that he may obtain the collective experience of the group in a thorough and orderly fashion.

In order that the constraint which is present in the atmosphere of authority be removed it is desirable that the chairman be selected if possible from among the lesser executives, and that he be a person who is well known and liked by the members of the group.

The project should not be viewed, however, as an activity which is beyond the confines of administrative authority. The group may be termed the Research Committee and the members of this committee and the chairman should be appointed by the chief administrator. When first called together he should outline to them the exact work which he desires accomplished and have it clearly understood that he expects results, in the form of a "Book of Administration" representing the consensus of their opinions on the subject of man management, to be later published for the use of the executive organization. The work should be well organized and the meetings conducted on company time as part of the week's work.

Success largely depends upon the detailed way in which the material for discussion is arranged for each meeting. The members of the committee should be given at the initial meeting a clear idea of the entire field of research. The exact topics for discussion at each following meeting should be prepared and distributed in writing to the members some days in advance so that they may come with their ideas in form for presentation. These advance sheets should present the subject in sufficient detail to make it tangible and concrete. It should be made clear that no writing need be done by the committeemen, that suggestions or ideas submitted verbally by them in conference will be recorded by a secretary under the direction of the chairman but that the member's name will not be noted. The data thus collected by the chairman at each meeting will be later edited by him and rewritten as a chapter in the "Book of Administration," which will be presented to the group for criticism or correction at the following meeting.

Use of Questionnaire

The field of investigation covered at each meeting should be controlled through the use of a questionnaire in the hands of the chairman. The answers to the inquiries when properly sequenced and edited will form the subject matter of a chapter. It should be the endeavor of the chairman to obtain a statement from each member of the committee covering each inquiry, the main points of which may be dictated by him to the secretary in the development of his working notes for use in writing the chapter under consideration. It is obvious that such a procedure presents limitations upon the size of the committee and a membership of twelve men exclusive of the chairman and secretary would appear to be a maximum figure. Each inquiry should be clearly presented, accompanied, if need be, with concrete illustrations or suggested answers so that its exact direction and extent is well understood. Working notes should be dictated covering all responses, even though their value may seem slight, as the knowledge that the statements of each member will go on record provides incentives for active thinking.

Makeup of the "Book"

The subject matter of the first chapter may well consider the general duties of the executive in the particular plant in question. The things which he is paid to do, the activities which make him of value to the organization, should be topics for initial discussion. His functions with regard to machinery and equipment, materials and supplies, and to labor, suggest subdivisions of the question. In every organization there is found to be a variance in the degree in which the

functions of maintenance are separated from the activity of operation. The first chapter will, then, clearly indicate this dividing line in the particular factory.

The second chapter may comprise a summary of those prerequisite characteristics in the individual which mark him as executive timber—the qualities which must be present in the personal makeup even before any training or education in executive work is begun. The man who has had experience in the selection of executives can at a glance discard many applicants who apply for the opportunity. What are the characteristics which they lack? When the statement is made "You can never make a good executive out of him" what basic qualities are missing? The determination of these requisite elements of personality for the particular work in hand will be of great assistance in the selection of understudies for the administrative organization.

Following this consideration should come the discussion of those essential executive qualities which can be developed through training or education. It is encouraging to note at this point that in instances where these questions have been considered the number of characteristics found in this latter group considerably exceeds those in the former. Every successful executive can look back upon his own experience and find many necessary qualifications to success which he attained through study and personal effort. What are these qualities and how may they be developed in the understudy? A thorough treatment of these questions by the committee and the ultimate publication of their findings for use by the executive organization cannot but be of great practical value.

Next, what are the tools of man management? What are the levers by which the executive influences the will of his working force? By what means does he influence them to perform the tasks of operation which are the fundamental activities of production? In this instance the advance sheets should suggest the character of the answer. The realization that typical attributes such as fairness, cheerfulness, frankness, friendliness and courtesy have definite tangible, determinable uses in management and will each yield certain results when properly or improperly used is not a common one. The discussion of this topic must bring these and similar factors out of the ethical and philosophical atmosphere in which they are usually treated into the light of a practical and unemotional analysis, that their industrial value may be concretely stated and understood. Their worth must be shown to be as direct when applied in the technique of handling men as that of the cutting tool when used in the fabricating process.

Effects of Human Conduct

It seems most essential that a part of the book be devoted to a brief interpretation of the impulses and desires which are found in every person, a knowledge of which will serve to explain many cases of conduct which are surely not the result of a reasoning process. The existence of the parental impulse,* the desire to possess, the wish to learn, and other similar conceptions can be simply presented by the chairman and the committee members called upon to cite examples of the evidence of each of these natural tendencies as illustrated by actual shop occurrences. Where a presentation of this sort had been made to an executive group the number of concrete illustrations which were immediately available from the listeners was most enlightening and satisfying. Two chapters may be well given to a simple explanation of these highly important factors in human conduct. Furthermore, a most helpful aid to this material would be the presentation of suggested ways in which the satisfaction of each of these desires or impulses may be accomplished to the end that the industry as well as the individual may be benefited.

With these discussions as a background the group is prepared to deal with the procedures of man management with the aim of determining the proper methods by which their executive responsibilities may be discharged. What is the "one best way" of introducing the new employee to the job, of enlisting his good will toward the work, of maintaining high standards of promptness and attendance, of praising, of rebuking, of criticising, of arousing interest in the work, of providing work incentives, of making wage increases most effective? What are the requisite characteristics of a good order; how, when, and where should it be issued; should it be delivered verbally, in writing, or both? These suggestions are merely examples of a great number of topics which can be collectively considered. When conclusions are reached by the committee they should be illustrated by concrete examples of their application in the factory. A well prepared chapter on these items will go a great way in stabilizing and standardizing the executive labor policy and its value in raising the level of the administrative technique of the organization and in educating the new executives for their tasks will be very marked.

A Chapter on Labor Morale

The closing chapter should contain a presentation of the best means of coping with those administrative problems which are commonly found in the factory. A careful study of the employee complaint will undoubtedly yield most enlightening conclusions with regard to the best way in which it may be effectively dealt with and the labor morale strengthened. This question, when considered in the light of each of the different motives which may inspire the complaint, unquestionably yields itself to searching analysis, which can be clearly presented to the committee through the medium of the well-prepared questionnaire. How shall we eliminate conceit from the workman and save him for the company? How shall we deal with religious differences between employees? Jealously, revenge and dishonesty are among the greatest enemies of labor morale. How may their potency be reduced to a minimum? When the girls in a department resign owing to the presence of one who, while an excellent worker, is of lower moral status what is the right way to handle the situation?

Such difficulties as these are common in the experience of every executive. The collective contribution of solutions to these problems by a group of earnest-minded executives who have proven their ability to handle help cannot but be of assistance in raising the standard of technique throughout the plant.

Use of the "Book"

Upon the completion of the book and its approval by the chief administrator sufficient copies should be printed in loose leaf form to supply perhaps one-quarter

*The book "Instincts in Industry"—Ordway Tead—will be found to be most helpful in gaining a practical conception of this field of inquiry.

of the executive personnel. The copies should then be assigned to executives for a period of one week with the request that each chapter be commented upon in writing. At the end of four weeks the chairman should call a meeting of the committee and review in detail these comments, and recommend to the chief administrator any alterations or additions which seem necessary. The books should then be filed in the executive offices and be made available upon request. The appointment of an executive will carry with it the requirement that the person so retained shall be held responsible for a knowledge of the book content. Each year a new committee should be appointed, the chairman, however, being retained as permanent editor. This committee will consider in detail the possibility of improving the standards as set forth, in the light of the past year's experience, and shall submit its findings to the chief administrator for approval. Those suggestions which are approved will be introduced into the text and the books again circulated throughout the executive personnel. Thus an opportunity for constant improvement will be opened.

The benefits resulting from such a program are worthy of mention. In addition to the improvement in technique which will result from the research described there will be found to be a perceptible increase in the executive morale. The significance and importance of their responsibilities as man managers will be made clear, their acceptance of the work of the committee will be a ready one, for the book will be looked upon as a product of their own organization, developed by men whose knowledge and practical experience in their factory is known and relied upon.

Finally, it may be stated that the accomplishment will mark a turning point in the manner in which the executives view their tasks. It will become at once evident that man management is not an art of mystery, is not a birthright of genius, but is a practical field of activity based upon underlying principles and laws which are susceptible of thought and study. They will sense the great advances which may come through analysis and careful investigation in their work of administration and will realize that instead of relying upon their intuitions they may *think* about handling men, and by studying their own methods make stepping stones of their errors and constantly improve their effectiveness as leaders.

The asset value of such classified knowledge in the minds of the executive personnel of any organization which results from the research suggested, while intangible, will be very great. It will provide the basis upon which management may construct an operating policy which will place it in its true relationship between labor, capital and the public. The accumulation in our American industries of such resources of information concerning man management will go far to maintain for our country her much vaunted industrial supremacy and safeguard her mills and factories from the attacks of the anarchistic agitator.

Know Why You Do Things

By A. W. Forbes

On page 612, vol. 53, of the *American Machinist*, I criticised a machinist who always set his tool at the height of the centers of the lathe, and on page 72 of the present volume, I showed why it should sometimes be placed *below* the center. The Editor apparently drew the conclusion that I wanted to have the tool regularly placed in this manner.

It is well established practice to place the tool on a level with or above center, and I did not consider it necessary to say so; but there are exceptions to this rule as well as to most others. A first-class machinist should consider each job on its own merits and know *why* he is placing the tool above center, so that he will know *when* he should not do so.

A Suggestion

By Henry W. Armstrong

In many shops some form of bonus is given to the employees when the shop is making money. This is the time when extra money is least needed by the employee who is working steadily and living well. The time when money is most needed by the workman is when the shops are laying off men and jobs are hard to find.

Would not the following be a better plan? Instead of paying a cash bonus to the worker why not set aside 10 per cent, or whatever the bonus amounts to, and let this money accumulate for a non-employment fund to be used as a sort of pension when bad times arrive?

Suppose, for instance, that a shop works five years in prosperous times. Then there would be 50 per cent of the average yearly payroll laid aside drawing interest. Suppose also that the sixth year is a year of poor business resulting in unemployment and hard times, then there would be a sufficient fund to pay every worker 50 per cent of his weekly earnings every week for one year, even if the shop should shut down during that time.

Also the workers might be induced to lay aside a part of their earnings at interest for the same purpose. Another benefit of this plan would practically insure the loyalty of the men, and the amount usually lost through labor turnover would be saved. A man who was discharged or who left the firm would lose all rights to the fund except the amount he has paid in from his own earnings.

When a man died or was sick the fund could also be used to the extent of his share in it. For instance, for a man earning $1,500, after a year's service there would be available $150 as sick insurance, death benefit or unemployment insurance.

If all the first-class shops, or in fact most concerns employing workers, would adopt this plan it would practically eliminate hard times and periodical prosperity, and as the entire amount could not be drawn at once except in case of death, the tendency to blow in the whole amount would be lacking.

Of course the money should be placed with some good trust company so that there would be no possible chance of its being used for any other purpose by the employers and also to show the employees that everything was open and above board.

It seems to the writer, who has given this matter considerable thought, that the average concern could well afford to adopt such a plan as it is probable that the annual loss through labor turnover is at least 10 per cent of the yearly payroll in most establishments. This plan would also attract the best class of workmen to the establishments adopting it and efficiency would be greatly increased. However, this is only a suggestion put forth for what it is worth.

Frames for Fords

Punching, Forming and Riveting Frames for Ford Cars—Good Examples of Progressive Arrangement of Machinery

BY FRED H. COLVIN
Editor, *American Machinist*

THE design of the Ford frame enables a comparatively plain strip of metal to be used, eliminating waste and making the punching and forming operation extremely simple.

The plate is first notched on one end and then punched, as can be seen by the two strips standing in front of the press in Fig. 1. This view also shows the knockouts or strippers *A* and *B*. It further shows the way in which the blanks are piled on the machine in front of the die so as to be handy for the operator.

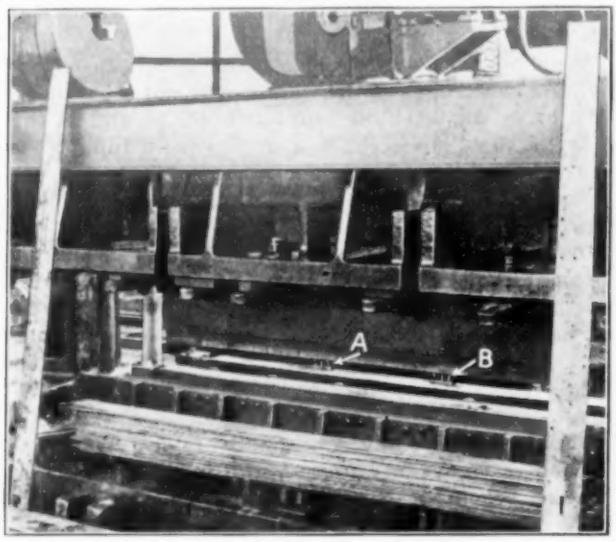


FIG. 1. THE PRESS FOR SIDE FRAMES

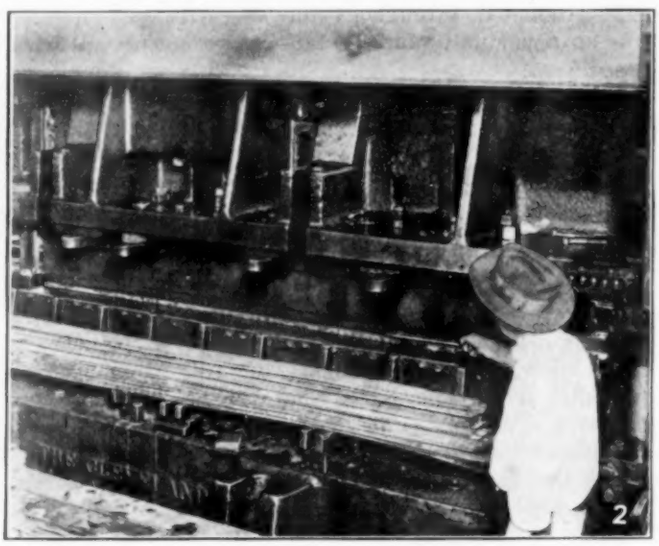


FIG. 2. FORMING A SIDE FRAME

Fig. 2 shows the side rail being formed, the man in the picture pointing to the side of the rail before it is forced completely down in the die. Fig. 3 shows the complete operation with the rail at *A* which was pushed out of the die by suitable knockouts, and also shows the same type of knockouts on the ram as were shown in the first view.

FORMING THE CROSS MEMBER

Forming the front cross member of the frame is shown in Figs. 4 and 5, the first showing the blanks in place in the dies, and the second the completed pieces, after the rams have made their strokes and returned to the upper position. The central parts of the dies recede as the punch descends, but the springs are sufficiently powerful to force the completed piece out of the die ready for removal. The strippers *A* and *B* prevent the piece being carried up by the return stroke of the press. By using two sets of punches and dies, two complete pieces are made at each stroke.

Forming the cross member for the rear of the frame is a somewhat difficult operation, owing to both the shape and the thickness of metal involved. Fig. 6 shows both the blank and the completed piece. The thickness of the stock is one-quarter inch.

The first forming operation, illustrated in Fig. 7, shows the blank in place and the punch just making contact with it. The substantial guides at each end, *A* and *B*, insure the alignment of the punch and die. In Fig. 8 the punch is at the completion of its stroke, while in Fig. 9 the punch is withdrawn and the completed piece is in the die ready for removal. Fig. 10 shows how two pieces are formed at each stroke.

The brake-lever quadrant is a comparatively simple piece to make. Before being assembled to the frame, the brake-lever notches must be broached, this being

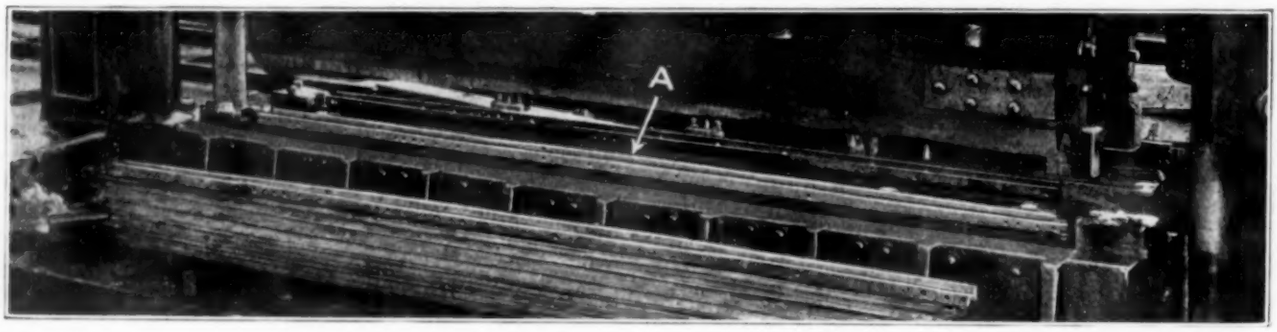


FIG. 3. SIDE FRAME COMPLETED

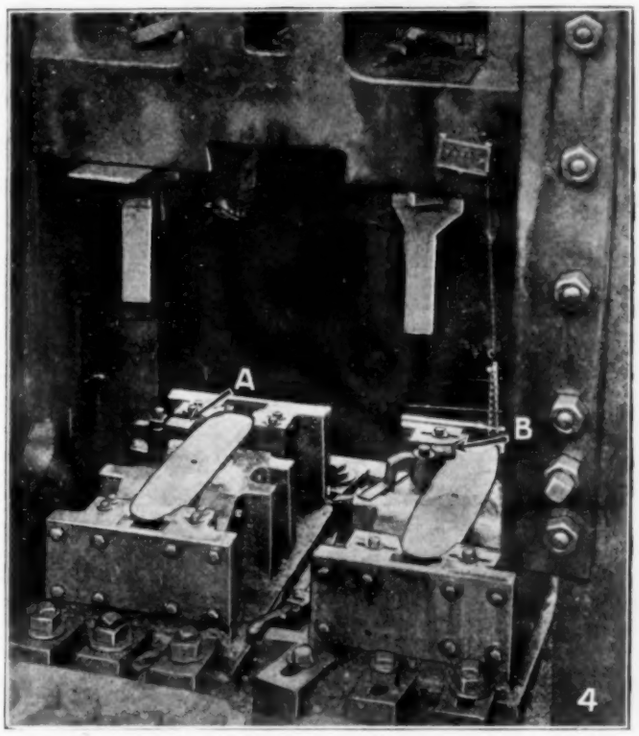


FIG. 4. FORMING FRONT CROSS MEMBERS

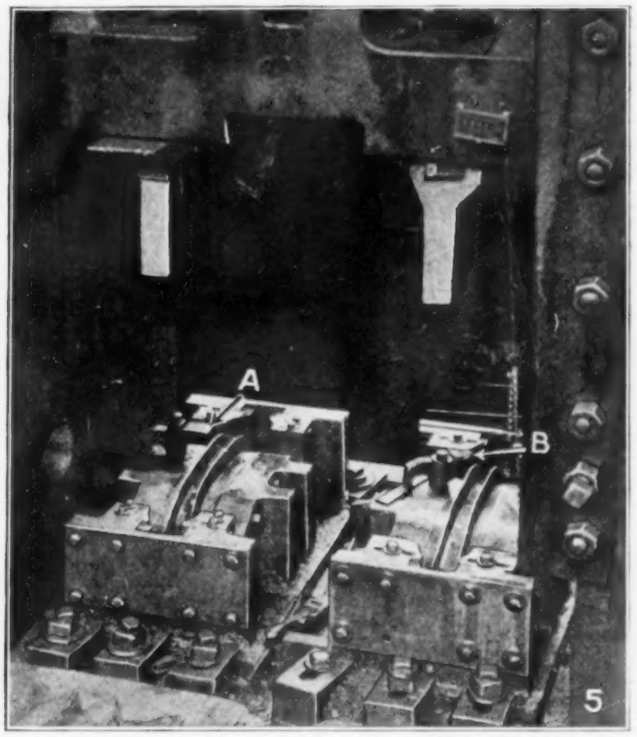


FIG. 5. TWO CROSS MEMBERS FORMED AT ONCE

done on the Lapointe machine shown in Fig. 11. The quadrants are held in the fixture at *A*, which is necessary to hold them firmly against the thrust of the broach teeth. A single stroke of the broach completes the notches as shown and the quadrants are then ready to go to the riveting presses for assembling.

Riveting Operations

These quadrants are assembled to the frames by cold riveting, as shown in Fig. 12, the quadrant being located by the shaped block *A*, and the rivets going into holes punched before forming. The small angle brackets for holding the body are riveted in the same way. Before assembling the cross members to the side frame, the parts are lined up by means of drift pins as shown at

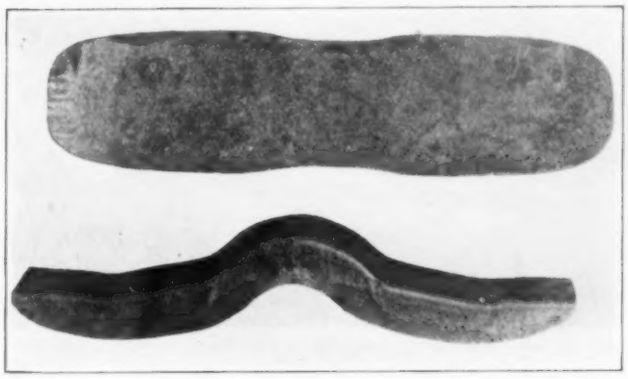


FIG. 6. THE REAR CROSS MEMBER

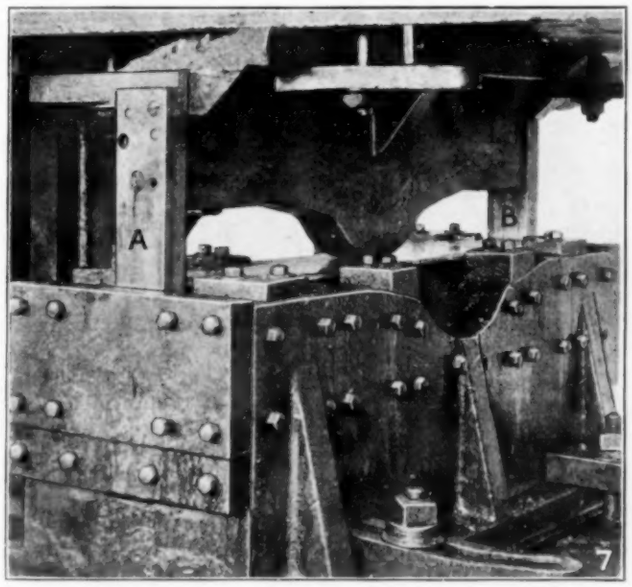


FIG. 7. THE PUNCH AND DIE

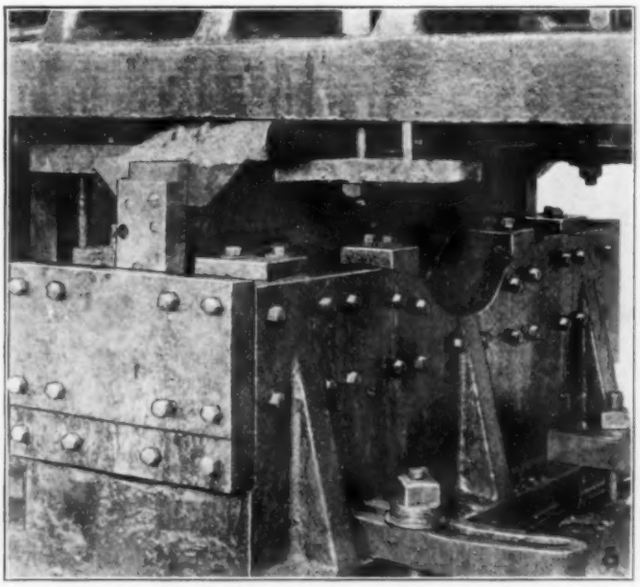


FIG. 8. THE END OF THE STROKE

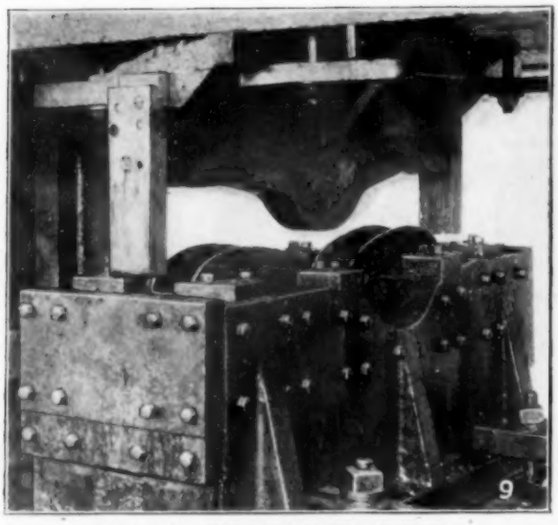


FIG. 9. THE FINISHED PIECE

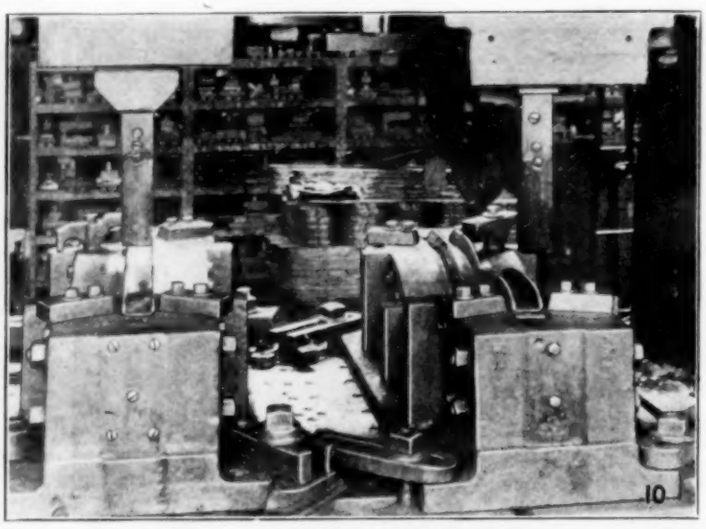


FIG. 10. THE DOUBLE PRESS USED

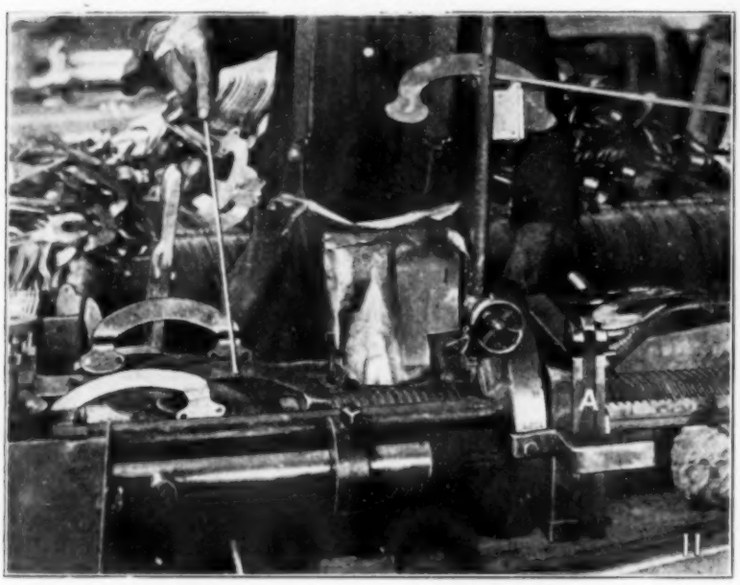


FIG. 11. BROACHING THE QUADRANT

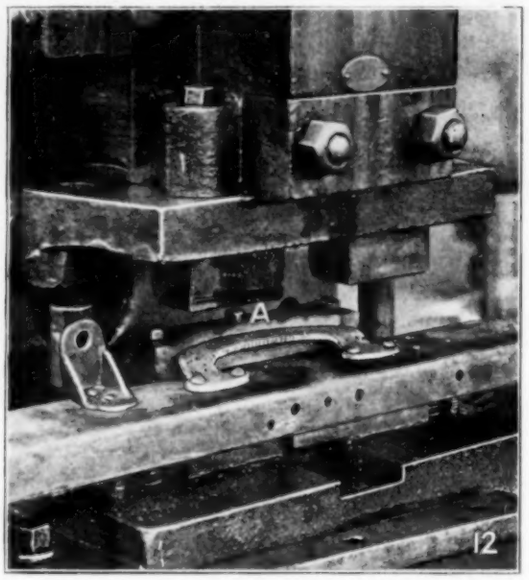


FIG. 12. RIVETING THE QUADRANT TO FRAME

A and *B* in Fig. 13. These enable the rivets to be easily placed and after one is driven the drift pin is removed by the method shown at *A*. The hook or claw is clamped to the side of the press frame, utilizing one of the gib screws as shown. The operator raises the frame until the head of the drift pin slips into the notch and a stroke or two of the press on the cross member loosens the drift pin which has been very firmly driven in place.

The riveting is then done as shown in Fig. 14, this press being fitted to one side of the frame, while the

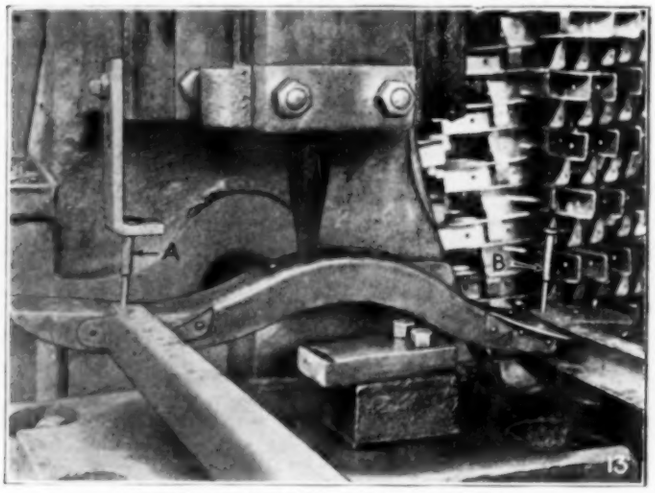


FIG. 13. KNOCKING OUT DRIFT PINS

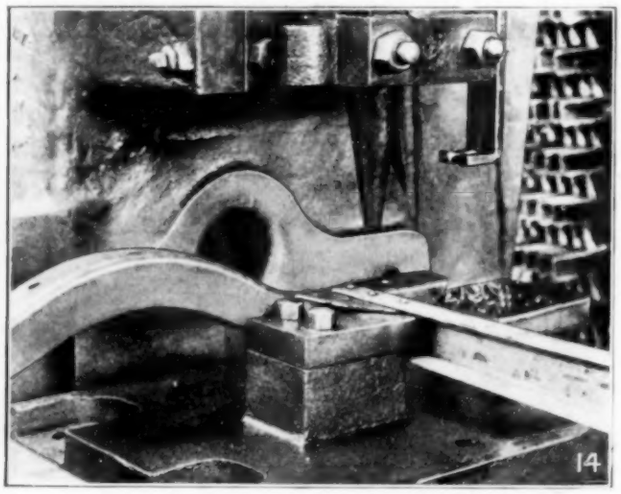


FIG. 14. RIVETING CROSS AND SIDE

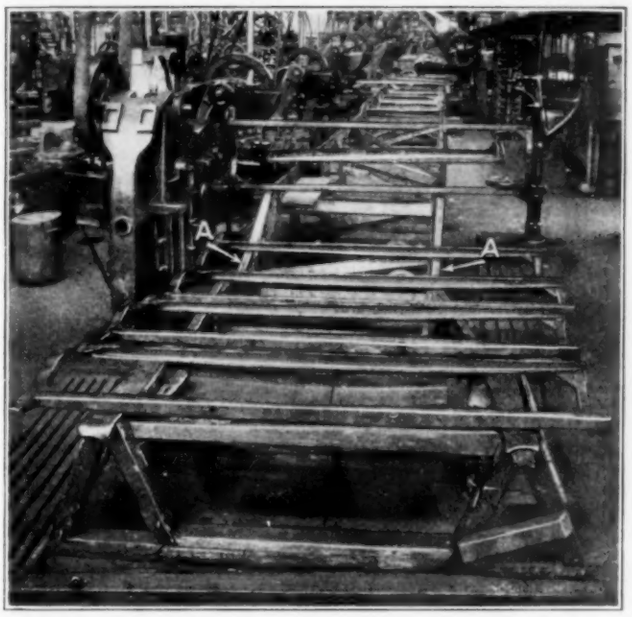


FIG. 15. THE ASSEMBLING LINE

press shown in Fig. 13 is for the opposite side. Each press is provided with a hook for removing the drift pin on the side which it rivets. The same difference will be noted in the position of the anvils or riveting blocks.

Handling the Frames

Some idea of the way in which the frames are handled can be had from Fig. 15. The assembling begins at the farther end of the long track in the center of the picture, the brake quadrant having been riveted to the left side rail before reaching this assembling track.

It will be noted that while nearly all of the riveting presses are on the left of the track there is one at the right and also a drilling machine nearer the finishing end. These machines are so placed because their use at this particular point in the assembly has been found to save time and avoid reversing the frames on the track. The press at the right rivets the front end cross number in place.

The track itself is constructed of scantling of suitable sizes, the upper edge being protected with a steel strap,

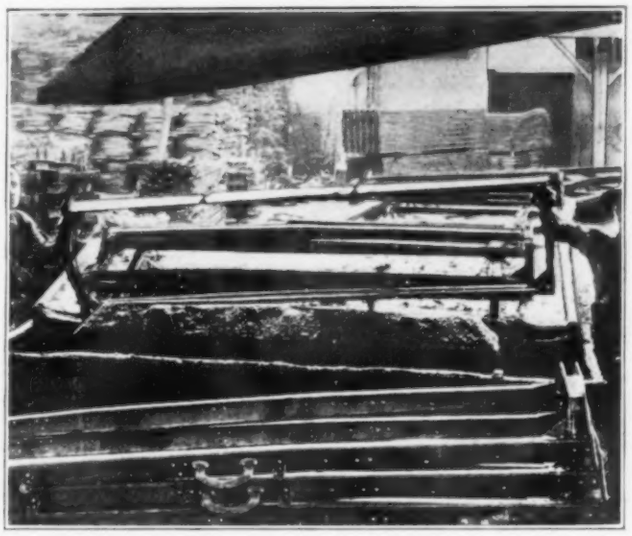


FIG. 16. PAINTING THE FRAMES

both to prevent wear and enable the men to move the frames more easily.

The height of these rails varies at different points but is always lower as the work progresses so as to avoid lifting. At *AA* there is quite a sharp decline ending in an abrupt curve. This is for the purpose of making it easy to turn the frame over and has been found to work out very satisfactorily. The assembling goes through like clockwork and the frames are turned out at a very rapid rate.

Painting

Last comes the first painting of the frames, which is done by dipping as can be seen in Fig. 16. The dipping tank is near the end of the assembling track and the frames are painted as rapidly as they can be handled. Over the painting tank is an exhaust head which removes the fumes and directly behind the tank, curving off to the right, is a track which carries the painted frame off to the storage pile which adjoins the shipping track.

These illustrations were obtained from the plant of the Michigan Stamping Co., Detroit, Mich., through the courtesy of President Charles E. French and Production Manager Oscar C. Bornholt.

Ford Differential Spider

THE spider for the Ford differential is of the three-pronged type, as can be seen in Fig. 1. The holes are first drilled at the rate of 90 per hour, after which they are broached one at a time on a Knowles keyseater at the rate of 225 per hour. Both sides are then faced, either with spot-facing tools in a Cincinnati drilling machine, or by special tools in the cross-slide of a Potter & Johnston automatic machine which handles 175 spiders per hour.

Chamfering

Chamfering is then in order, this being done on an Allen single-spindle drill, after which the three arms are cut to length on either a Garvin or Pratt & Whitney hand milling machine, the former being shown in Fig. 2. This illustration also shows the chute by which the work comes to the milling-machine table, as well as the height of the holding fixture. The fixture supports the spider by a central stud, and instead of feeding the table the fixture carrying the spider is revolved by means of the hinged lever shown. The pin *A* is used in driving the spider past the cutter, the lever *B* being connected with a ratchet so as to feed the spider continuously and mill all three ends.

Operations on the Arm

The arms are then centered in the special centering machine shown in Fig. 3, the work being mounted on an indexing turret so as to insure the proper centering holes. In this machine the drilling spindle is fed into the work by means of the lever shown.

The arms are next rough and finish turned for their

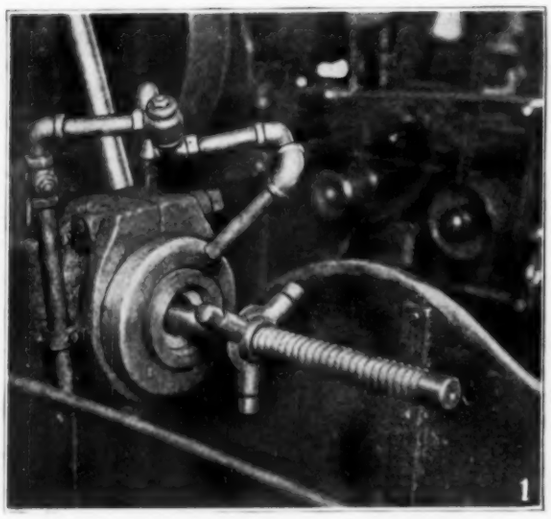


FIG. 1. BROACHING THE SPIDER

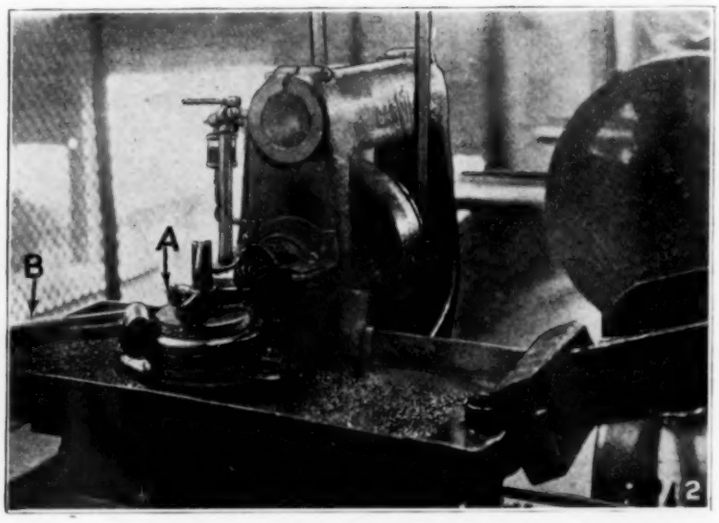


FIG. 2. MILLING ARMS TO LENGTH

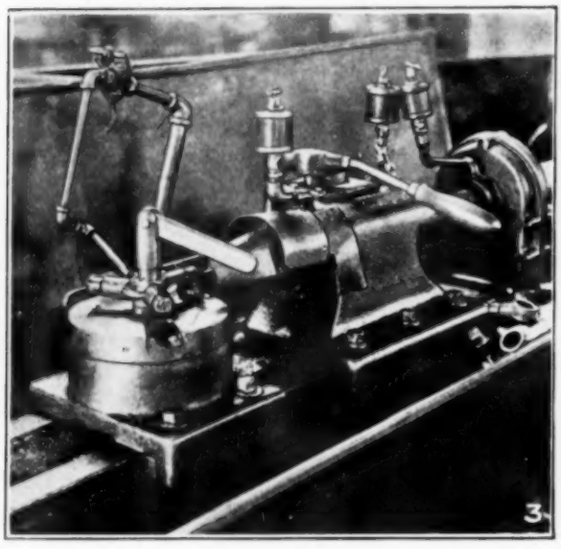


FIG. 3. DRILLING THE CENTER

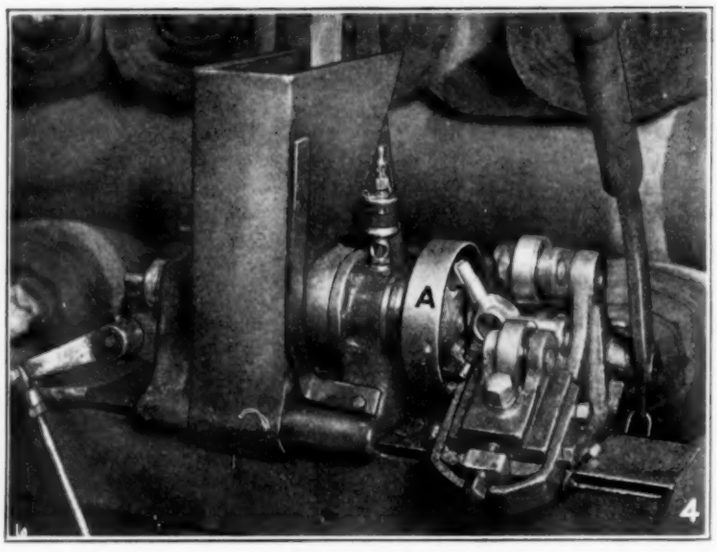


FIG. 4. FINISHING BY ROLLING

pinions and the outer bearing, and finally finish turned by rolling in the small special machine shown in Fig. 4. The driving head *A* carries suitable pockets for two of the three arms. The two lower rollers support the arm being finished while pressure is applied by the upper roller, this combination enabling the finishing to be done at the rate of 65 spiders per hour, which necessitates fixtures that can be readily handled.

The Ford Differential Gear Case

THE Ford differential is a compact unit, and the quantity required, 5,200 per day, is large enough to warrant such special tooling as may be considered advisable. The shape of this case is clearly shown from the two pieces at the loading station of the Bullard Mult-Au-Mat-ic, shown in Fig. 1. It will be noted that this machine carries two work spindles for each station, making a total of 12 spindles in all. The method of supporting the wrench for tightening can be seen at *A*. The wrench housing slides on the bar in front of the machine, and can be readily used on either chuck. Each station of the machine is double-tooled and double-lubrication pipes are also provided, as can be seen. The toolhead at *B* shows how a great variety of tooling can be accomplished in such a machine. Each machine handles 80 cases per hour.

The thrust washer surface and hub are next rough machined on another set of Bullard Mult-Au-Mat-ics, as in Fig. 2. Here the differential case is reversed, the case being centered by means of a central bolt *A* and driven by a jaw *B*, which takes all the tool thrust, and effectually prevents any slippage under the cut. This operation can be performed at the rate of 213 pieces per hour.

The finish turning of the radius comes next, this being done on Reed-Prentice lathes, utilizing special mandrels and toolposts, as in Fig. 3, which are designed with a view of rapid handling, as can be seen from the fact that the production is 200 per hour.

Three $\frac{13}{32}$-in. holes are next drilled on the inverted three-spindle drilling machine shown in Fig. 4. These machines handle 90 pieces per hour, the work being

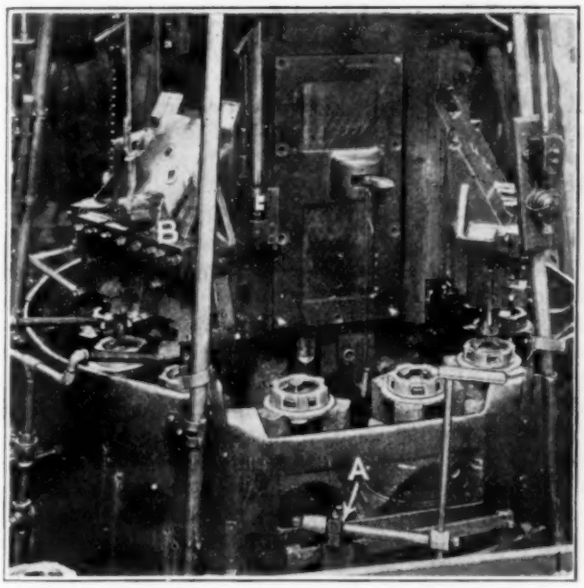


FIG. 1. BORING AND REAMING DIFFERENTIAL GEAR CASE

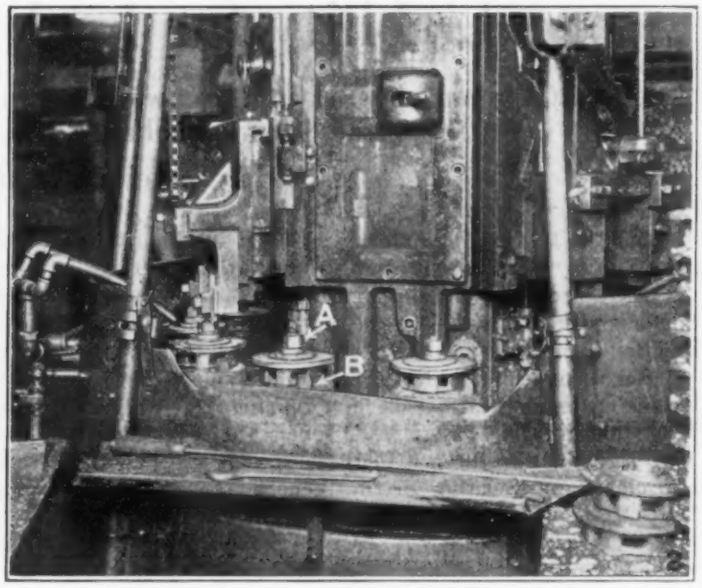


FIG. 2. TURNING THE BACK AND FACING THE HUB

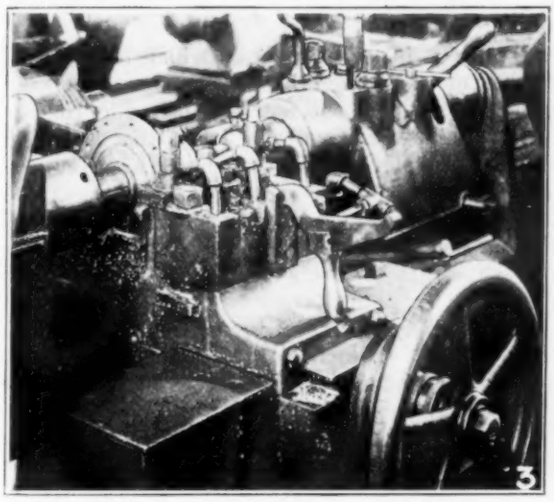


FIG. 3. FINISHING THE HUB RADIUS

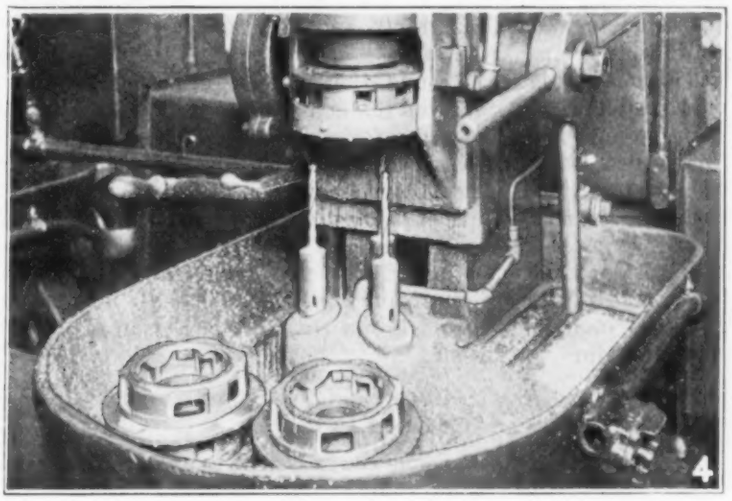


FIG. 4. DRILLING THE THREE CROSSHOLES

held in a quick-acting fixture in the removable head of the machine. After this another hole is drilled and the three holes already mentioned are burred and spot-faced. The cases are then filed on a Ford special filing machine, after which they are washed and inspected, and ready for the assembling department.

Want Ads

BY C. I. HEIKES

Your discussion of "Want Ads" and their apparent inability to do all that is expected of them is interesting because all the writers seem to view the subject from one standpoint—namely their own. Facts and theory both prove that this is bad practice. We are all actuated by more or less selfish interests, and it is by a proper understanding of this fact that most good advertisements are written. Likewise disregard of it usually means a disregarded advertisement. Take for example, the remarks of Charles F. Smith, on page 103 of the *American Machinist*. True, this is not an ad, but note the viewpoint of the letter. It is concerned almost entirely with Mr. Smith's qualities—or lack of them.

It is an old saying that it takes two for a quarrel. Just as appropriate is the fact that in an advertisement it takes two to get results, the writer and the reader. The average unskilled ad writer forgets that though he is most interested in the ad from his standpoint, the other fellow's is just as important, and that to get an answer the other fellow's is most important. For what the other man wants, what be believes and what he is willing to accept, is the factor that will determine the success of the ad. How then to reach the other man? A brief analysis and study of the ad will usually give some clue to the writer's character or wants. Often the ad explicitly states the wants, yet answers received often show that the applicant has completely disregarded the wants and registered his own instead, as is aptly stated in the letter of A. W. Forbes on page 107 of the same issue—"such letters naturally receive the least attention." On the other hand a letter which seems to understand the needs of the man who has written the ad and shows an honest ability and willingness to meet those needs gets attention at once.

For a rule to measure your ad by and also a guide in answering want ads the following might well be used—"consider the other fellow's wants, and adapt yourself to them."

Liability for Lack of Ventilation

Scope of Common and Statutory Laws—Liability Under Compensation Acts—Effects of the Safety Appliance Laws, or Factory Acts

BY CHESLA C. SHERLOCK

AT FIRST thought employers may not feel that there is any legal liability imposed upon them in regard to providing an abundance of fresh air in their factories and shops. There may be some specific statutes requiring proper ventilation by employers engaged in certain occupations which subject the employees to an excessive temperature, especially during hot weather; but what liability is imposed upon the general employer, without reference to these special cases? Must the employer, speaking in this general sense, consider himself liable for sufficient ventilation in his place of work?

The employer's liability to his workmen divides itself at the present time into a consideration of his duties under two branches of the law: the old common law, and the statutory law which, in his specific case, is found in the factory acts, the safety appliance acts and the workmen's compensation acts.

The common law was founded on the general proposition that it was the duty of the employer to do two or three specific things toward safeguarding his employees. In the first place, he was held to furnish his workmen "a reasonably safe place in which to work." He was bound to furnish safe tools and appliances with which to carry on that work, and he was also bound to give the workman adequate instruction in the use of such tools, and to inform him of any conditions of which he might be familiar that would aid the workman in preventing injury to himself.

THE WORKMAN'S RESPONSIBILITY UNDER THE COMMON LAW

At this point, the common law ceased to impose any great measure of liability upon the employer. The workman was then expected to exercise due care, to concern himself with his own welfare, and unless negligence of the employer entered in, the workman was solely liable for all injuries and accidents which occurred. The workman was assumed to have reasonable knowledge and skill in the work, and if he continued to work where conditions were injurious to his health or well-being, he was held to have "assumed" the risks of injury or incapacity and could not, therefore, look to the employer for damages or compensation.

The question of whether the employer would be liable at common law for a failure to provide adequate ventilation in his place of work is more or less of a mooted question. It is evident, however, that where the conditions are unusually deplorable that the employer might easily be held liable, under the very first injunction that he must "provide a reasonably safe place in which to work."

A place poorly ventilated is not, it should seem, a "reasonably safe place in which to work." A workshop, factory or mill might be defectively ventilated and still be held to be "reasonably safe," but the temper of the courts is changing and they do not hesitate to liberalize those features of the common law which seem harsh and out of date under present, modern conditions of work. The employer who is in doubt had best play on the safe side and place a liberal construction upon that old phrase of the common law.

Of course, where the factory acts or the safety appliance acts take up the subject of ventilation specifically in certain employments, the employer, if he would avoid liability, has no choice but to comply strictly with the provisions of the law as it applies to him.

The courts have pointed out again and again that the employer cannot be held as an insurer of the health and well-being of his workmen. But he will not be permitted to trifle too lightly with these possessions of the workmen. He will be held, where there is no specific reference made to the subject by the statutes, to do all that other employers in the same employment are reasonably doing to make the place and the conditions of work safe.

There are many forms of work in which it is impossible to prevent excessive forms of temperature. In such a case, the employer will not be required by the law to provide the same variety of ventilation that he might be required to provide in an office room or a factory.

The feeling at common law was that if the workman was familiar with the kind of work and took up that occupation he could not hold the employer liable if the lack of fresh air injured his health or decreased his earning capacity. While it may be true that the employer has not, in such a case, furnished the workman with a "safe place in which to work," he has certainly furnished a "reasonably safe place," taking the nature of such work into consideration.

DEFECTIVE TEMPERATURE APPARATUS

There is, however, another feature to the matter which must not be overlooked. Suppose that the apparatus which the employer uses to gage the temperature, or the machinery he uses which generates the excessive temperature, happens to be defective and in fact carries a temperature many degrees greater than it registers or which is necessary for the work. One might conceive a case where a temperature fifteen or twenty degrees greater than necessary was carried. This might easily cause the workman to be overcome or so impair his physical vigor as to materially reduce his earning capacity. In such a case, the employer would doubtless be held liable in damages, under the common law, for the injury done, because the proximate cause of that injury was the employer's negligence in failing to keep his appliances in repair, or to inspect them.

Still another case under the common law may be mentioned where the employer might be liable. The employer is bound, under the common law, to furnish the workman adequate instruction and to give him the benefit of his superior knowledge in the trade or calling, especially where the workman is inexperienced, so that the workman may be warned of the dangers attendant upon the work.

Suppose that an inexperienced workman went to work in a room where an excessive temperature had, of neces-

sity, to be maintained. The employer did not tell him that until he became used to such temperature that he should leave the room at frequent intervals and get a breath of fresh air outside. The inexperienced workman remains in the room too long, failing to gradually acclimate himself to the temperature, and is overcome. Perhaps, it leaves him in such a condition that his earning capacity is materially reduced or his physical vigor permanently impaired. There can be no doubt but that the employer would be held liable for the payment of damages to this workman at common law, if the matter were properly presented to the courts.

The Employer's Common-Law Liability

The employer's common-law liability, then, is predicated upon negligence, as a rule, and unless this negligence is present, he cannot be held to pay for the injuries sustained. It is, broadly speaking, a negligence with respect to, or a failure to meet, the three fundamental propositions already mentioned.

In order that there may be no misunderstanding, we will again call attention to the fact that the employer can be liable under the common law only where he has expressly rejected the terms of the workmen's compensation acts, or where he is doing business in one of the six or seven states which have not, as yet, adopted the compensation system. However, where safety appliance acts and factory acts have specifically treated of the subject of ventilation, the employer is bound by them, as they abrogate the common law in so far as they change its provisions by specific mention.

Liability Under Compensation Acts

The liability of the employer for insufficient ventilation under the workmen's compensation acts, is slightly different than in other cases. The basis of liability under the compensation acts, as we have pointed out before, is not upon negligence, as under the common law, but upon the fact that injury has occurred as a result of an "accident" arising out of, and in the course of, the employment.

There are dozens of cases which might be cited upon the subject of atmospheric conditions under the workmen's compensation acts, which have pretty fairly defined the employer's liability.

For instance, it is fairly well settled that the employer is liable for overheating where the risk to such injury is materially greater than that which the people in the same locality are normally subjected to. This "common hazard" is the basis of operation in determining the employer's liability in such cases. If the temperature in a place of work is materially greater than it is elsewhere in the same community, the hazard to overheating is increased by the employment, and if the workman is overcome, the employer is liable for any injury done to him.

If the employment thus increases the hazard, the overheating is an "accident" within the meaning of the compensation acts. While the courts were a long time in doubt on the subject, this little finding from an English case is now recognized as authority on the subject: "Prostration by accident may be found to be an accident within the meaning of the compensation acts."

Where the employment materially increases the hazard to other diseases, or breakdown of the physical body, the employer will be liable, where the injury has been due to improper ventilation. Improper ventilation which results in pneumonia or tuberculosis, if such fact can be proved in evidence, would render the employer liable for the payment of compensation.

In one case, a workman was required to work in a damp place for several hours bailing water out of a grain elevator which had been flooded by the rapid rise of a river. The grain, only a few bushels of which was left in the bottom of the elevator, rapidly became moldy. While the workman was down in this dark, damp pit, he was compelled to breathe this air. Pnuemonia resulted and he died. It was contended and proved by his dependents that breathing the mold spores which were in the air, caused his death. The employer was forced to pay compensation.

The same ruling holds true in cases where dust is generated, by reason of the employment, greatly increasing the hazard of the workman to lung diseases and disorders. The mere fact that the workman is acquainted with the hazards of the work no longer excuses the employer from liability. He must either provide some means of getting pure air to the workmen, or he will be held liable under the workmen's compensation acts for the payment of compensation, when loss of earning power is sustained by workman as a result of such cause.

Specific provisions in the safety appliance acts, the factory acts or industrial codes relating to ventilation must be strictly complied with without reference to the workmen's compensation acts. The mere fact that the employer is to pay compensation in case injury occurs is not sufficient reason for holding that the compensation acts abrogate the safety appliance acts or other acts which seek to prevent injuries.

The two forms of legislation are entirely independent of each other and a compliance with the one form will not relieve the employer from the obligations of the other. What takes place between the compensation acts and the common law, does not take place between the compensation acts and the safety appliance acts or the factory acts.

The Factory Acts

In the latter case, the safety appliance acts or the factory acts seek to *prevent* injuries due to certain conditions which experience has taught are apt to rise out of the work. If these acts as passed by the authority under which the employer is doing business specifically provide certain forms of ventilation, the employer must obey them to the full letter and spirit thereof or he is very likely to find himself suffering other penalties and forms of liability which we have not mentioned here.

The compensation acts, however, seek to compensate injuries *after* they have taken place, and in spite of the measures taken in complying with the safety appliance acts, the factory acts, or the industrial code. The employer who takes this distinction into account is not likely to become confused as to his liability at the present time, provided he is operating in a state where the compensation acts are present.

Where the common law governs him, he will often find the safety-appliance acts further elaborating the common-law theories of a "safe place to work, reasonably safe tools and appliances, and adequate instruction and inspection," which he must satisfy as under the compensation system, but after the accident has occurred, he will find the common law regulating the manner in which the injured workmen can recover damages for the injury sustained.

There is a liability, under either system, for insuffi-

cient ventilation in the place of work, and it is the sort of liability which is best met in a preventive fashion. Ventilating systems are now perfected to such a degree that it is possible for employers in almost any line of work to take care of their employees adequately. And the employer should not allow these systems, once installed, to get out of repair. It pays to prevent, where there is a possibility of legal liability attaching.

Meeting the Present Emergency

By A MIDDLE WESTERN DEALER

WE ARE going through a crisis, and a very serious one. If there was ever a period that called for level-headedness and a belief in our country, now is the time. Beginning as far back as last April we saw from our records, and other indications, that the demand for machine tools in our territory was slipping. That stimulated us to put forth a greater effort to corral orders, and as we entered into the summer and latter months of the year, with business continuing to decline, we put forth every ounce of selling force that we could muster in our organization; also, we increased our advertising, hoping to keep our sales at a maximum, rather than permitting them to go to a minimum, and by so doing we kept our organization busy.

Sales Result From Not Cancelling Orders

In the meantime, even with declining sales, contrary to what is understood as good business judgment, instead of cancelling orders with our sources of supply we had our manufactureres fill our orders and increased our stocks of machine tools and supplies, believing that during this depression the demand, when orders were placed, would be for immediate delivery, and the concern who could make delivery would stand a better chance of securing the business if delivery could be made from stock.

I am very much pleased to state that the carrying of a large stock has meant orders for us during the past three months which we would have surely missed otherwise.

We have found it necessary (due to the fact that we had built an organization in size beyond our requirements, for war work and the subsequent busy period), to lay off a small percentage of our force. The old organization is practically intact, only those whom we looked upon as extras being affected by this reduction in force. We are carrying now an organization that is amply large to take care of what we have arbitrarily determined would be a normal business for us had there not been a war. It is our contention to continue our present force, with the belief that in the near future there will be a general improvement in business.

Buyers' Strike Waning

The "buyers' strike," which the newspapers frequently refer to, will be over before long and there will be a demand generally for merchandise and equipment of all kinds. Incidentally there will be a growing demand for motor cars, which, of course, is vital to much of the Middle West, inasmuch as its business is built up directly and indirectly on the automobile industry.

It has been somewhat pathetic to hear the viewpoints occasionally expressed relative to conditions in Detroit and other automobile cities, where about 60 per cent of all motor cars, passenger and commercial, are built.

As Hugh Chalmers recently remarked, there are too many people in this world who are lacking in a sense of humor who endeavor to make up for it by having, without any basis, an enlarged sense of "rumor," and unfortunately spread it.

Those who are not familiar with conditions have been of the opinion that Detroit has gone to the bowwows, which is far from true. It has, of course, felt the depression about the same as others in their respective cities and states. Those in the automobile territory are optimistic, and are so in a practical measure. Many of the plants are possibly carrying more men than needed, but they have found work for these men to do. They are putting their plants in order, rebuilding and repairing old equipment, in addition to building cars to fill orders, studying production methods, giving consideration to purchasing new and more modern equipment to help them reduce their production costs, etc.

Look for Improvement Soon

Summing up the whole situation, it looks to us as if business will open up before a great while, and we will then need our organization to look after the requirements of our customers, and even though our sales this year may not reach the volume that our organization is set for, on the other hand you can readily perceive what would happen to us if we were to lose our staff. While the business we are securing at present does not give us a large enough profit to pay our operating expenses, yet we are sure that the gross profits for the year as a whole will be enough to help us break even. Then again we feel that we should keep as many employed as our finances will permit, and it is with happiness that I can say that many of the concerns out this way are doing likewise.

It is interesting to know that during the past week there has seemed to be a better feeling or sentiment existing. Many of the plants are taking on more men, and are beginning to increase their output, and have advised us that they have received additional orders, which necessitated the increase.

How to Use a Hacksaw

By J. C. Nicholson

Some of us older mechanics learned to use a file skilfully before hacksaws were much in vogue, and then when the saw came we found using it one of the most laborious things imaginable. To any who are still in the throes of that labor, here's a word of advice: Just forget that you are using a hacksaw and imagine you have a file in your hands instead. It may not work equally well in all cases—much depends on concentration and on previous skill—but it has been a valuable aid to one man and is at least worth trying.

Repairing Air-Brake Hose Connections

Special Equipment Eliminates Much Laborious Work—Connections Are Salvaged, Hose is Scrapped—The Special Devices Described Are Pneumatic

BY J. V. HUNTER
Western Editor, *American Machinist*

REPAIR work on air-brake hose connections at the Decatur car shops of the Wabash Railway Co. has had much of its laborious part eliminated by the development of special equipment. This great system has tens of thousands of freight cars in service with an air-brake hose connection on each end and the passenger coaches also have steam hose connections, so that the total number of these coming in for repair would be a man-sized job without the mechanical aids mentioned.

Practically all of the repairs are occasioned by the failure of the hose due to deterioration. Therefore no attempt is made to save the hose, it being destroyed by the methods developed for expeditiously salvaging the connections.

A Stationary Piston

The bolts in the end clamps are usually so rusted that it is not considered good policy to save them and they are therefore cut in two by either one of two air-operated shears provided for that purpose. The smaller of these, Fig. 1, serves largely for connections whose bolts are small and light. This shear is built of a forged-steel frame mounted on heavy timber blocking. Power is furnished by a 5-in. diameter air cylinder *A* which has been mounted so that the yoke of its plunger piston is attached to the lower stationary member of the frame and the cylinder rises when admission of the air causes it to work the arm of the jaw. The admission of air to the cylinder is controlled by a foot lever operating through the bar *B* to a spring-operated air valve at *C*. The yoke *D* over the upper arm controls the length of the stroke so that this may be adjusted by the setscrew *E* to prevent damaging the shear blade.

A heavier and more powerful bolt clipper, Fig. 2, is used to cut the larger bolts that bind the clamp on the steam hose. This machine requires two operators, one to hold the hose in position, as shown, and the other to control the air valve at the rear; but in the near future, by the application of a foot control lever, it is expected that only one operator will be required. A section of steel channel forms the base of this machine and on the rear end is mounted the 9-in. air cylinder *A*. The plunger of this operates through a combination of toggle levers, showing where the arms project through the safety guard at *B*, and these in turn work the shear head. The entire mechanism is inclosed in a sheet-metal case, so there is no danger to the operator.

A Two-Purpose Device

All who are familiar with rubber hose work know how the rubber lining attaches itself to the iron connectors, thus causing great difficulty when the removal of these is necessary. However, this shop has solved the problem in a very simple manner. In the illustration, Fig. 3, is shown a device that was first designed for holding a piece of air hose and driving the connectors in its end; but since this machine is also used for taking the coupler out of the hose, it is necessary to describe it in greater detail before showing how the preliminary operation is accomplished. The whole device is mounted on a large steel channel which has a vertical upright *A* at its back for mounting the air cylinder *B*. This cylinder serves for clamping the rubber hose in a fixture consisting of the stationary piece *C* and the movable shell *D* carried on the piston of the air-cylinder plunger. These shells are formed so that they inclose a length of hose, as shown, and tightly clamp it when the pressure is applied from the vertical air cylinder. The air cylinders mounted on the ends of the table are fitted with special tools for pushing the metal connectors into the ends of the hose; and also for the operation which must be performed first—that

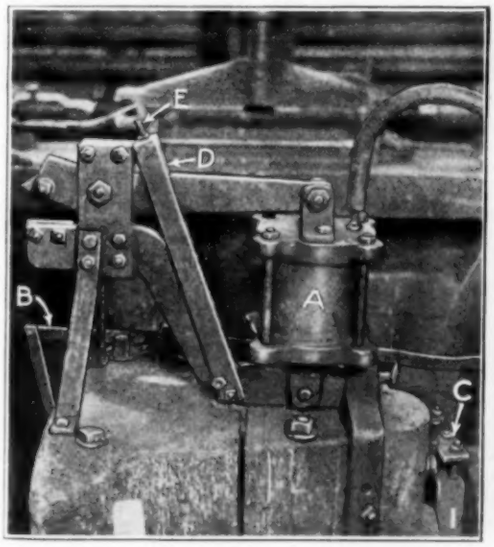


FIG. 1. SMALL AIR-OPERATED SHEAR FOR CUTTING HOSE CLAMP BOLTS

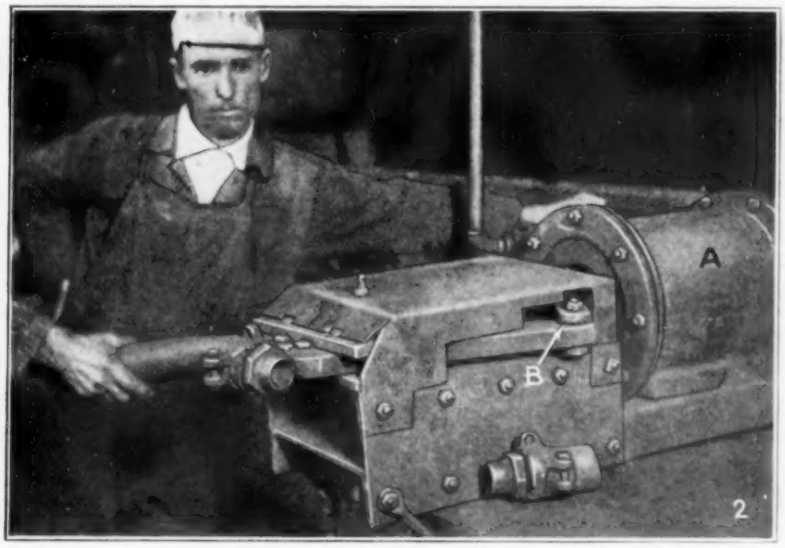


FIG. 2. HEAVY HORIZONTAL AIR-OPERATED SHEAR FOR CUTTING STEAM-HOSE CONNECTING BOLTS

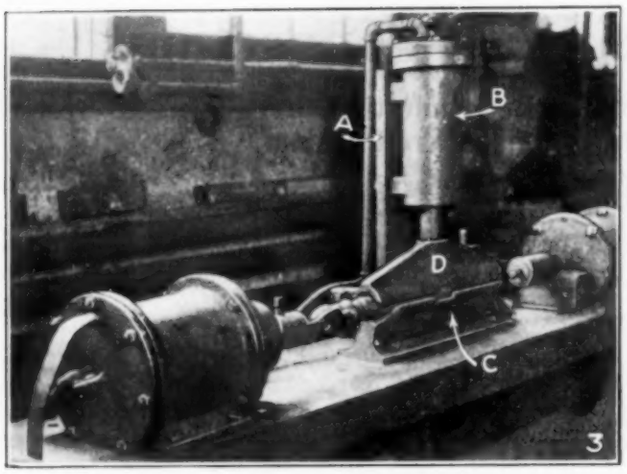


FIG. 3. DEVICE FOR REMOVING CONNECTORS AND INSERTING THESE IN NEW AIR HOSE

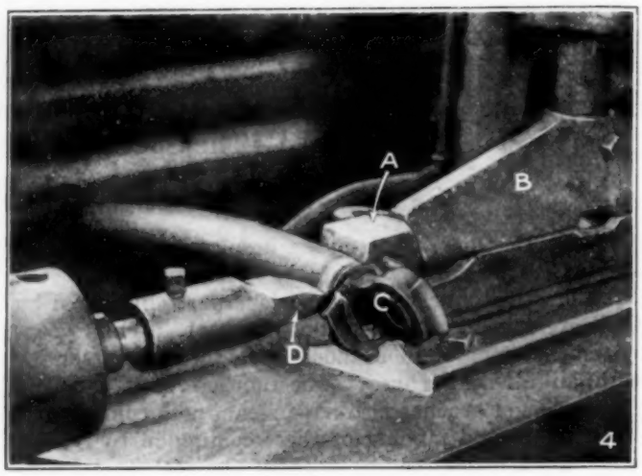


FIG. 4. METHOD OF SHEARING HOSE FOR SALVAGING CONNECTORS

of removing the connectors from the old pieces of air hose. In Fig. 4 is shown the method of removing the connector from old air hose. A U-shaped section of steel *A* is fitted with a round shank which permits it to be held in the hose clamps *B*. The jaws or inside edges of this U-shaped section are ground to knife sharpness and the distance between the two edges is just sufficient to pass over the stem of the air-hose connectors *C*. An air hose is laid in the position shown and the plunger of one of the horizontal cylinders carrying the pointed ram *D* is brought forward thrusting the hose into the block *A*. The latter serves as a stripper, shearing the hose away from the metal and freeing the connectors so that they readily drop out. Of course, it is understood that the clamps have been removed previously and this operation is done successively on the two ends, thus giving connectors ready for insertion in new sections of hose.

A larger, but similar, device has been made for performing this same operation on the heavier sections of steam hose. This stands vertically and is mounted on a section of steel channel. A 10-in. air cylinder serves to operate the ram and the piston plunger has been provided with a guide block which insures that it will be held properly in alignment. The stripper block is held by a setscrew in a bracket bolted to the same channel.

As previously indicated the operation of driving the end connections into a new section of hose is performed, as shown in Fig. 5, by clamping the hose in the air-operated vise jaws *A*. The plunger on the air piston is fitted with a socket *B* for holding different forms of tools. The illustration shows a straight mandrel that is provided for driving the pipe connections into one end of the hose. The hose is not removed from the vise for driving the coupler in the other end as this is served by the second cylinder, and the operations on both ends can be performed simultaneously if desired.

The device shown in Fig. 6 is used for pulling the ends of the hose clamps together for the insertion of bolts. It consists of two jaws, one stationary and held in base *A* while the other *B* is the upper end of the lever arm *C*. Both vise jaws are crescent in shape so that only their points catch the ends of the hose clamps.

When the movable jaw is operated by the application of pressure to the air cylinder *D*, the ends of the clamp are drawn together, thus making insertion of the bolts easy. The air for the cylinder is controlled by a valve, whose handle extends through the top of the table at *E*. Additional springs *F* are provided to draw back the plunger and release the clamping jaw when the bolt has been tightened.

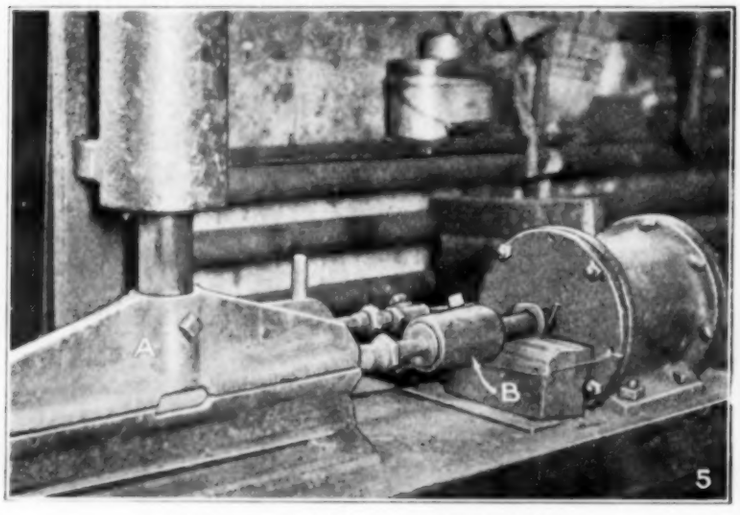


FIG. 5. PRESSING PIPE CONNECTORS IN AIR HOSE

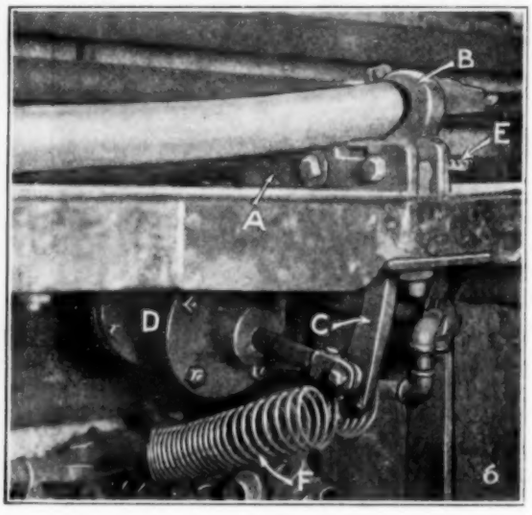
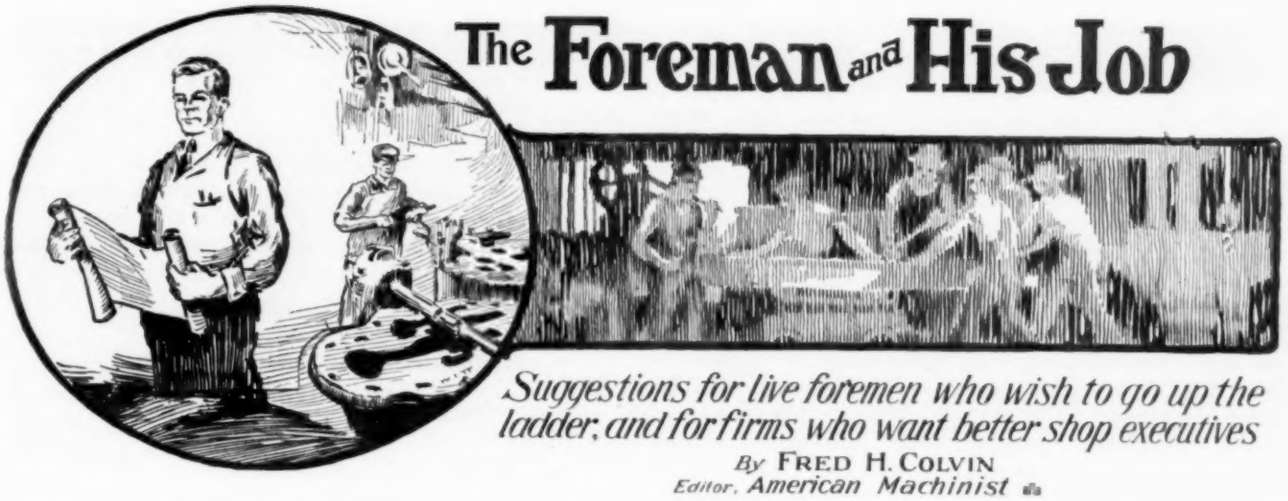


FIG. 6. DEVICE FOR HOLDING CLAMP WHILE INSERTING BOLTS



The Foreman and His Job

Suggestions for live foremen who wish to go up the ladder, and for firms who want better shop executives

By FRED H. COLVIN
Editor, American Machinist

WHILE we all know the value of teamwork in a general way, it is not always easy to apply it to our own cases. The desire to make a good showing for one's self or for one's department is very apt to put the necessity for team work into the background. The very spirit of competition, which has so many good points, brings out the trait of "Every man for himself and the devil take the hindmost," which is the very opposite of team work.

Whether your department is making a single piece or a complete assembly, it is easy to see that nothing is gained by having certain operations or certain pieces completed long before the rest. Suppose for example that you are making automobile cylinders. The output of your department depends on the number of completed cylinders which it can deliver per hour or per day. It does not increase your output to have the milling machine man mill twice as many cylinders as your boring machines can handle. If someone with a grouch has a grudge against the cylinder grinder and interferes with his work, it not only delays the grinder but also the whole department.

A REAL TEST OF BIGNESS OF CHARACTER . . . HAVE A MAN TRANSFERRED FROM YOUR DEPARTMENT WITHOUT TRYING TO BLACKEN HIS REPUTATION

In the same way the practice of some foremen of trying to steal men or material from some other department in order to increase their own production, hinders rather than helps the output of the plant as a whole. And we must remember that it is the completed machine which brings in the money for the pay roll, and that if any department is behind from any cause whatever, it delays the output of the whole plant. This same spirit of unhealthy rivalry delayed the production of field guns for the army during the war. The gun division was separate from the carriage division and co-operation was lacking for many months. As either guns or carriages are useless without the other, time was lost by the failure to co-operate so as to have them both come along at the same speed.

Individual performance counts for comparatively little in the production of anything in large quantities unless each individual can be brought to a high average performance. It is better to get 75 per cent output of all the parts than to get 100 per cent of some and only 50 per cent of others. The machines cannot be completed until there are a sufficient number of *all* the parts.

If for example, one department slights its work to such an extent that the next department must spend an unusual amount of time in performing its operations, the apparent increased output of the first department is a real detriment to the output of the plant as a whole. And not only is team work necessary between departments but also between the men in any single department, no matter how small it may be. This is why a group bonus is often much more satisfactory than an individual bonus, although sometimes both can be utilized to advantage. It is also one of the great reasons why many feel that the foreman should be counted in on a bonus for the output of his department.

Many plants have adopted the daily conference between the shop or production manager and the foremen of the different departments. It brings the men face to face each day, or as often as may be considered necessary, and reminds them constantly of the futility of one department trying to get ahead at the expense of any of the others. It makes the foundry man careful about promising castings several days before he knows he can get them out. It shows up the patternmaker if the delay is due to his not getting the patterns out when promised. It is very effective in preventing the common but un-

satisfactory practice of "passing the buck." These meetings show the management which foreman is actually producing the goods and which one is trying to lay the blame where it does not belong. They show those who produce results, and those who try to get by with excuses.

Teamwork however is not secured by simply desiring to help the other fellow out. A knowledge of how to do so is equally important. Good judgment or "common sense" is one of the best qualifications in this as in many other occasions which arise. It is the ability to watch the different details, to bring the various parts along in approximately the same quantity to the assembling department, that gets the desired results. Many a shipment of valuable machines has been delayed and a lot of money tied up because some comparatively insignificant piece had been overlooked. This is, of course, looked after and followed up by the production department "chaser" in many places, but the foreman who keeps things moving along without having to be chased, is in direct line for a deserved promotion.

Teamwork can be of great assistance in putting over any new plan or system which may be installed by the management. No matter whether the plan or system seems best to you or not, it is part of your job to try and make it work as planned. Some object to the installation of an employment department as taking away part of the foreman's rights and duties. But employment departments are part of all modern establishments of any size.

Co-operating With Other Departments

The foreman's relation with the employment department presents a good opportunity for him to show that he can work with the management and co-operate in making the plan effective. Here is one of the many places where teamwork counts and he should do his best to help the employment department secure results. By keeping in close contact with the employment department and seeing that it knows exactly what kind of men he needs; by trying to utilize the men selected or suggested; he will soon find that he receives much assistance and that the employment manager is trying to get the kind of men he wants.

No foreman can expect to get the best results out of every man who comes into his department, but he should try to find out the reason and correct it if possible. Certain temperaments do not seem to get on well with each other at all times and this plays its part in all sorts of work. There are bound to be men who will either not do their best work, or be happy under certain types of foremen, and it is folly to try to make people who are naturally antagonistic pull together unless it is absolutely necessary. By far the best way in such a case is to transfer the man to some other department. And here is where the employment department plays an important part.

It is for this reason that many shops have taken the power of direct discharge away from the foreman, and it is probably better so. If, after a fair trial their natures clash it is usually easier for all hands to notify the employment department and have the man transferred to another department. This should be done without any resentment or hard feeling and nothing should be done to make it hard for the man who is transferred.

It is one of the tests of real bigness of character to be able to ask to have a man transferred from your department without trying to blacken his reputation in any way. It takes a broad minded man to admit a failure of any kind, but men of this sort have a much larger future than those with narrow dispositions.

The foreman who is big enough to say: "Jones and I couldn't seem to understand each other or get along very well, but he's a good man and ought to make good in some other department," will go a long way up the ladder of shop management. The man who is small enough to try to shift all the blame on the other fellow has no place in the modern shop.

Applying Magnetic Chucks to Best Advantage

By I. A. Hunt

Upon looking over recent numbers of the *American Machinist* the writer was surprised to learn that his article under the above title had started an argument. Since he is no longer connected with the manufacture of magnetic chucks of any kind his further remarks should be without prejudice.

Like Amos Ferber, who states that C. A. Macready's criticism of the article puzzles him, I do not understand just what Mr. Macready has in mind. The points brought out in the original article are applicable to any make of chuck. If a solid top plate or auxiliary plate can be used in place of one in which the poles are insulated, then the manufacturers would surely like to know it, for it would eliminate a lot of expensive work in making top plates. But they would also have to be shown.

The basic principle of magnetic holding power is the flow of magnetic lines of force from the positive to the negative pole, and to complete this circuit through the solid steel plate placed on a magnetic chuck, as Mr. Macready suggests, would immediately neutralize the poles so that the lines of force would not enter any work that might be placed upon the chuck.

The only way in which a solid steel plate may be used as an auxiliary plate is to make it so thin that it cannot carry all the lines of force, thus allowing some of them to find a path through the work; but this condition is too limited to warrant the broad statement made by Mr. Macready.

As to the question of the expense of top plates, this depends upon the user. If he has a standard production job where many duplicate parts that are to be held by the chuck would require an auxiliary plate, then it will pay him to buy one to fit his chuck; if he has temporary use for an auxiliary top plate, a little ingenuity will enable him to make up pieces of steel that can be set over each polepiece and separated by non-magnetic metal like brass, or, if the work is stiff enough, the spaces between the poles can be left open. This stunt can be used on any type of chuck, although, of course, the steel pieces or extended poles must be placed in accordance with the arrangement of the poles.

The other criticisms are somewhat obscure and would seem to indicate a prejudice in favor of certain makes of chuck, whereas, such tricks as extending the poles to secure the best points of contact, etc., can be applied to any chuck if the basic principle of a magnet is remembered. The points illustrated in the original article are basic and intended to elucidate the magnetic principles in a way that will enable a mechanic to apply them to meet his requirements on any of the magnetic chucks now manufactured.

New Use for Drill Jig

BY F. W. SHUMARD

The common method of machining the clearance in piston wristpins for the connecting-rod bolt is by means of a radius cutter in a milling machine. Although the fixtures used are usually made to machine more than one pin, the cutter must "cut air" between pins, thus losing many seconds between loadings. Also, the cutter must be kept quite sharp to reduce chattering and wavy finishes.

The writer has found that the clearances can be cut in a drill press. Fig. 1 shows a cold-rolled steel piston wristpin in which the $\frac{7}{32}$-in. radius is to be machined. Fig. 2 shows a drill jig that is used in a one-spindle drill press, using a standard $\frac{7}{16}$-in. high-speed steel twist drill ground in the ordinary manner. The jig holds two pins during the operation, and a production of 600 or more pins per hour is obtained. The accuracy and finish of the slots are much better than on those milled in a milling machine.

Referring to Fig. 2, two of the pins are placed in V-block *A* against the stop pads *B*. Cam handle *C* is pushed down and displaces the clamping arm *D*, in the end of which is screwed a steel cam plate *E* for the cam *F*. Clamping arm *D* swivels on pin *G* and has two steel shoes *H* at its other end. These shoes swivel on screws *I* and contain the threaded clamping pins *J;* four of which secure the work. Block *K* is screwed and doweled to the main cast-iron base and carries the drill bushing *L*. The bushing has two radii milled in its bottom end to clear the work and thus permits of piloting the drill close to the work. After the drilling, and the clamping arm is free, the work is removed from the V-block by knockout *M*, a sharp lateral movement of which will kick the work out into a box over 2 ft. away from the jig, and during this movement the operator picks up the two pins he selected while the drill was in feed and places them in the jig the instant the completed pins are knocked out.

Since the cut is intermittent a press having a power feed must be used and all lost play taken up in the drill spindle.

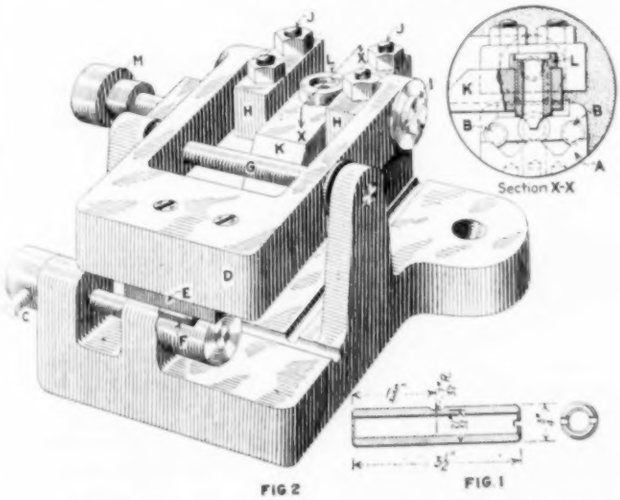


FIG. 2. DRILL JIG FIG. 1. PISTON PIN

Fixtures for Continuous Milling

BY LESTER FERENCI

I have found in my experiences in the tool line that in the design of fixtures the machine vise is very much neglected, and its value not fully realized. In many cases the cost of a fixture can be reduced from one-third to one-half by utilizing the vise as a base for the fixture. It is especially adapted to fixtures for small parts on the milling machine and shaper.

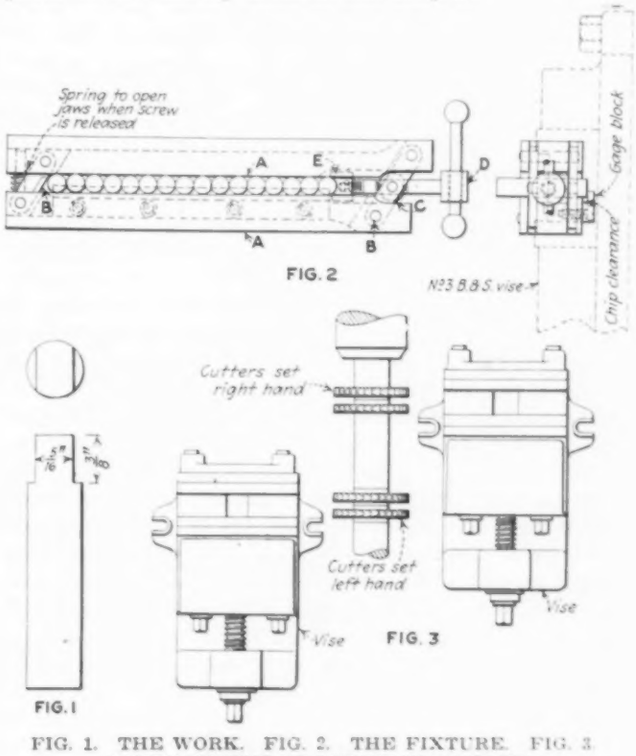


FIG. 1. THE WORK. FIG. 2. THE FIXTURE. FIG. 3. ARRANGEMENT OF VISES AND CUTTERS

Not very long ago we had a large quantity of the parts shown in Fig. 1 to make of drill rod cut to length, diameters varying for different lots from 0.375 to 0.437 in. and requiring straddle milling at one end. The job was done on a Brown & Sharpe automatic milling machine as a continuous milling operaton. Three small fixtures, similar to the one shown in Fig. 2, and clamped in machine vises, served the purpose excellently, doing away with the elaborate and expensive fixtures ordinarily required for such operations.

The machine was set with a fast feed owing to the small amount of stock the cutters were required to remove, and therefore the fixtures had to be fast working to keep the machine running continuously.

The fixtures consisted of two jaws *A* connected by links *B* at top and bottom. Between the two links at the right-hand end was mounted a floating stud *C*, through which clamp screw *D* tightened shoe *E* securely against the work. Further motion of the clamp screw brings the jaws against the work.

Two vises were set up on the milling machine table, separated by a distance of about 18 in., each vise in a separate keyway, and two sets of cutters working in opposite directions to correspond to the feed of the machine and to the position of the vises were set up. The arrangement of vises and cutters is shown in Fig. 3. As soon as the work in a fixture was finished it was replaced by the extra fixture, which had been loaded while the machine was cutting.

A Question of Design

By P. A. Fredericks

Most machine designers have probably at one time or another been called upon to locate a screw for moving a unit on its slide. If the screw has to support weight, or resist thrusts in addition to its functions of moving the unit, it is sometimes rather difficult to determine where it is best to put it. Take, for instance, a milling machine knee as shown in Fig. 1.

In this instance the screw at a distance *A* from the face of the column is expected to act both as a support for the weight of the table, work, etc., and as a means of accurately raising and lowering. A glance through catalogs of milling machines shows that the later designs have emphasized the importance of the supporting functions as shown, by bringing the screw farther out from the face of the slide. On some machines this is quite pronounced. Evidently the idea was to, as nearly as possible, locate the screw under the center of gravity of table and work, or possibly to minimize vibration by getting a brace out as far from the face of the slide as possible. The center of gravity, of course, varies considerably, as the table and work may stand anywhere on the top slide of the knee, and in addition it appears that serious inaccuracy in the operation of the machine may be introduced by bringing the screw out too far.

If, for instance, the screw is exactly on the center of the column slide as in the plan, Fig. 2 (which appears never to be done on milling machines), then the force applied to move the knee would always be central with the resistance. In such a case, although the knee might sag a trifle due to the weight of the table and work, the sag would always be the same amount and in the same direction.

But if the screw is moved out, then a couple is set up as soon as force is applied to move the knee either up or down. The result is that when moving up the end of the knee rocks upwardly and when moving down the reverse is true.

The tests on some machines where the relative distance *A*, Fig. 1, was considerable, showed a difference in reading of 0.003 to 0.004 in. taken on a dial indicator touching the column face 12 in. above the table. The difference showed as the direction of movement was reversed.

On a machine used for toolroom work, for instance in boring holes in jigs, this difference would be entirely too great. It would seem that this rocking movement, if other things were equal, would be least in the following instances:

A. Least when the distance *A* (Fig. 1) is least.
B. Least when the distance *B* (Fig. 1) is greatest.
C. Least when the slide fits close enough to avoid lost motion but not close enough to stick or bind.
D. Least when knee, column and slide are stiffest and most rigid.

It therefore would appear that unless there was considerable reason to move the screw out, caused, for instance, by the necessity of adding to the resistance of the unit or by limitations in the position, the screw for moving the unit should be placed as close as possible to the slide, since most of the other factors listed above are only capable of a certain amount of control in the average design. It goes without saying that the screw should whenever possible be set central with slide in the other projections.

A test of conditions similar to Fig. 1 with a movable screw and with varying position of weights placed on the table gave the following results:

A = 7 in.—Rocking movement = 0.0012 to 0.0015 in.
A = 10 in.—Rocking movement = 0.0017 to 0.0023 in.
A = 12 in.—Rocking movement = 0.0025 to 0.0038 in.

In the above the maximum rocking was when the weights were nearest the column, the minimum when

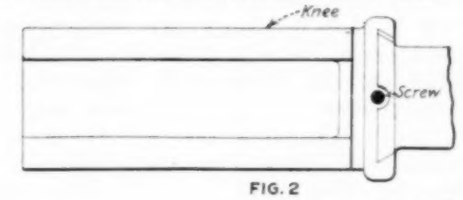


FIG. 2

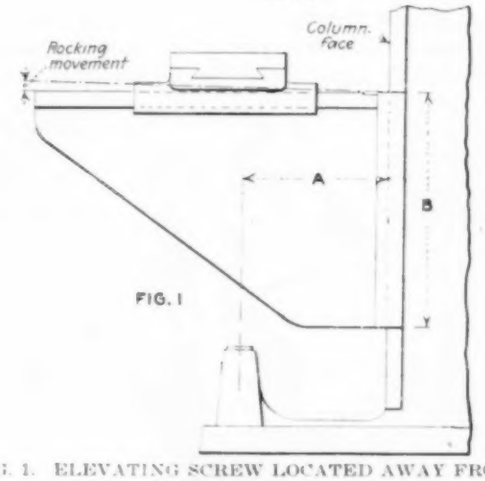


FIG. 1

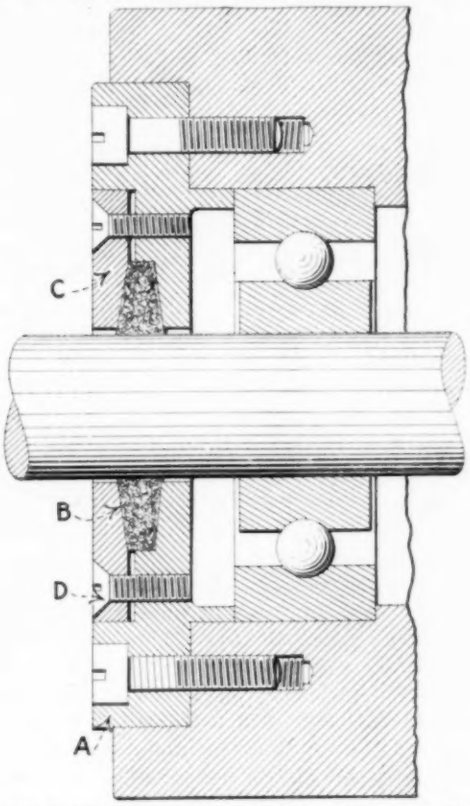
FIG. 1. ELEVATING SCREW LOCATED AWAY FROM COLUMN. FIG. 2. ELEVATING SCREW IN CENTER OF COLUMN

directly over the screw, and about half way between the two extremes when the weights were farthest out, though we had expected to find the maximum when farthest out.

Adjustable Oil Retainer Plates for Ball Bearings

By C. F. George

In designing some new machines it was desirable to use a considerable quantity of ball and roller bearings of various types and I anticipated trouble in packing the retainer plates to make and maintain an oil tight



ADJUSTABLE OIL RETAINING RING FOR BALL BEARING

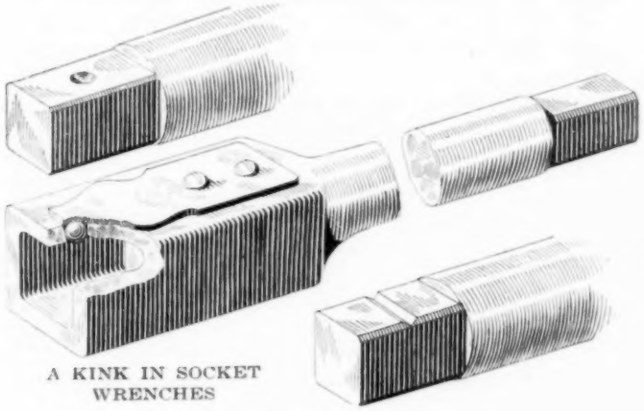
joint. I met the difficulty by devising the adjusting packing plate shown in the illustration.

The main retainer plate *A*, which holds the bearing in place, need not be moved after the machine is assembled. The felt *B* is inserted in position and the plate *C* moved along the shaft and held in place by the screws *D*. These screws also provide for adjustment of the packing.

A Socket Wrench Kink

By Hugo F. Pusep

A convenient little kink applicable to the socket wrenches commonly used for small taps and reamers is shown in the accompanying illustration. A description is almost superfluous, as the idea may be so readily grasped from the picture.



A KINK IN SOCKET WRENCHES

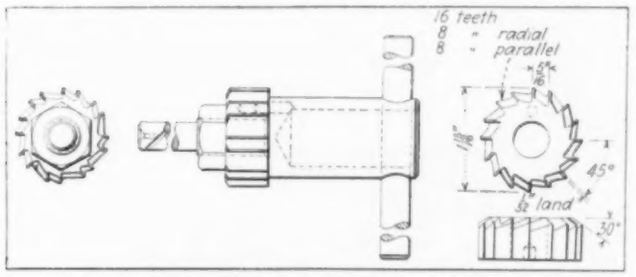
It will hold any shank that fits it without preparation of the shank; but if a stronger or more certain hold is desired, a groove or a countersink on one or more of the flats of the shank will serve that purpose.

A Valve-Seat Reamer

By C. H. Dengler

The accompanying illustration shows a valve-seat reamer to be used after the first machining of the valve seats and before the final grinding in of the valves. This tool is one of the many that helped to build the Hispano-Suiza airplane engine.

The cylinders of that engine are alloy-steel barrels screwed into an aluminum block, the valve seating directly in the barrel top. The first machining left chatter marks which were difficult to remove by grinding in the valves, but this tool smoothed them up and greatly facilitated the grinding-in operation. The pilot



DETAILS OF VALVE-SEAT REAMER

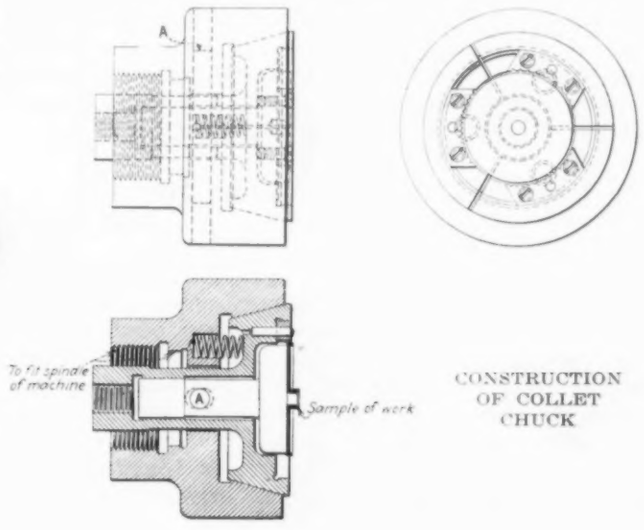
is made to fit the valve guides. The cutter has 16 teeth, 8 of which are radial, while each intermediate tooth is parallel to the one preceding it.

Collet Chuck for Holding Thin Round Work

By Edward A. Nevins

The illustration herewith shows a chuck for holding thin metal parts while machining them. It is so designed that when the jaws are closed on the work the latter is drawn back against the squaring plug which occupies the center of the chuck and is pinned to it by the dogging pin *A*.

This pin passes also through the collet, but the hole in the latter is elongated to permit sufficient end move-



CONSTRUCTION OF COLLET CHUCK

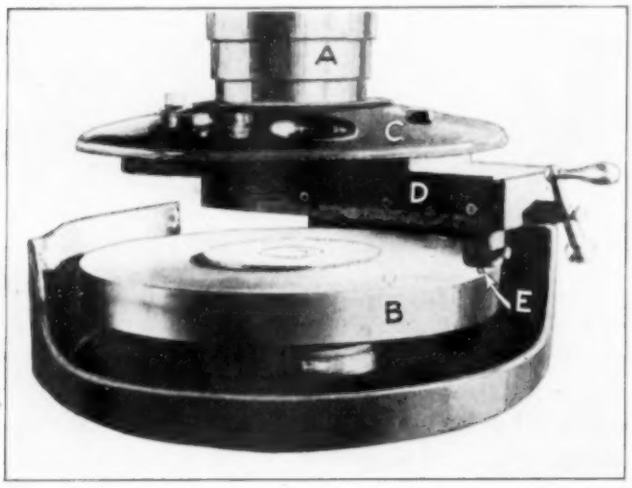
ment to open and close the jaws, which movement is derived from a draw-in rod and handwheel at the rear of the machine.

Separate jaws properly attached to the leaves of the collet serve to hold the work, and these may be made to suit whatever piece may be desired. Three coil springs force the collet forward, allowing the jaws to open as soon as tension on draw-in rod is released.

Facing a Part of a Machine in Place

BY E. A. DIXIE

We recently built a large number of machines which were in general shape somewhat like a vertical drilling machine, although they were intended for quite another purpose. The cone pulley *A* is carried on the spindle of the machine, and secured to the lower part of *A* is the plate *C*. Situated in a pan below is a sort of table *B*. It is essential that this table have its top surface accurately parallel with the lower surface of *C*. For this reason it was decided to surface *B* after all the assembling of the machine was completed.



THE MACHINE AND FACING FIXTURE

The slide *D* was designed and built especially for the surfacing job. It carries a tool *E*. While a star feed could have easily been arranged on the end of the feed screw of the surfacing slide *D* this was not done, but the job of feeding was turned over to an apprentice. The speed was quite slow (about five turns per minute), so that the operator had plenty of time to turn the crank handle the required amount each time it passed him. The result was very satisfactory, the face of *B* falling within 0.002 in. of being parallel with the lower surface of the member *C*.

Bending Rings in a Milling Machine

BY GEORGE G. LITTLE

We had to form some rings of brass rod of rectangular cross-section, and as the available rods were too light to do the work we had to do the next best thing—use something else. After some study over the matter it was decided that the best way was to rig up the milling machine with a set of rolls and use the arbor for holding one of the rolls, as shown in Fig. 1.

A pair of rolls 2 in. in diameter and 1-in. face with trunnions $\frac{3}{4}$ in. in diameter was put between two pieces

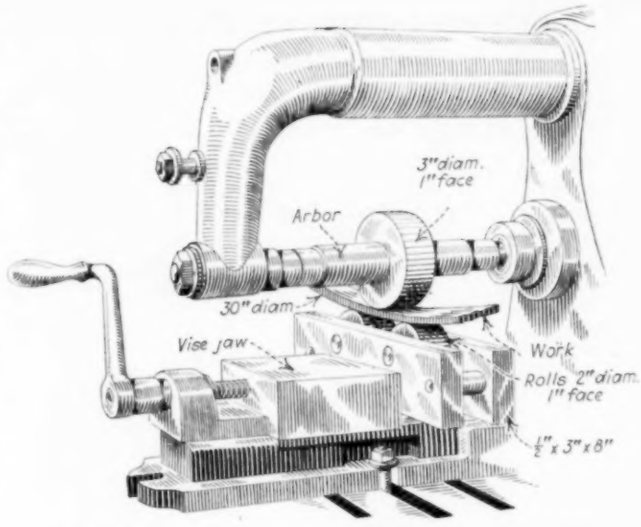


FIG. 1. ARRANGEMENT OF ROLLS FOR BENDING

of $\frac{1}{2}$ x 3 x 8-in. cold-rolled steel having two spacing blocks arranged to provide free turning of the rolls. A roll 3 in. in diameter and 1 in. long having a 1-in. hole was secured on the arbor with the usual spacing collars and nut.

The overhead arm supported the arbor while the two lower rolls were held in the machine vise. By raising the table in the usual manner the rolls were arranged properly to form the rings, which were 30 and 36 in. in diameter. Fig. 2 shows a similar method of using two rolls for flattening copper wire. The wire was No. 10, bare, soft copper and was reduced to 0.100 in. thick in three passes. The lower roll was made of cold-rolled steel 4 in. in diameter and fitted with a ball bearing which reduced the friction enough so that the friction of the wire between the rolls was sufficient to make the reduction in size and carry it through.

In forming the brass rings the stock was left 3 or 4 in. longer than the finished circumference and was but slightly bent in the first pass, the machine platen being raised by the vertical feed screw for each pass till the ring assumed the proper diameter.

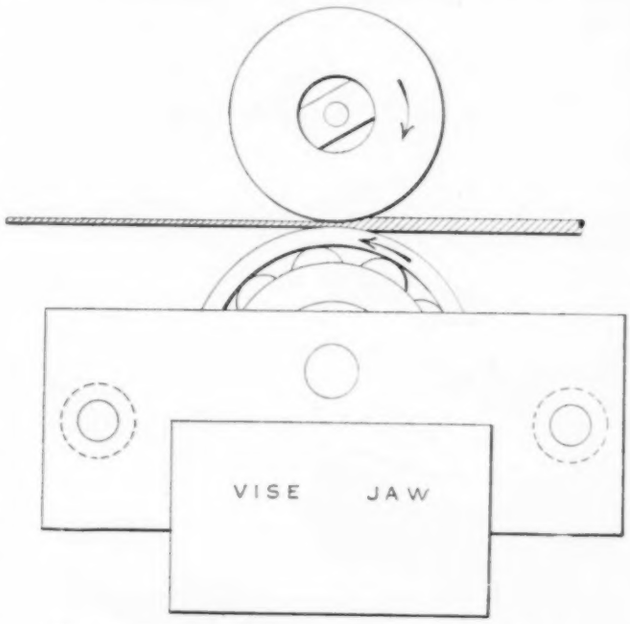


FIG. 2. ROLLS FOR FLATTENING COPPER WIRE

A Loose-Leaf Mechanical Encyclopedia

By C. V. Lovell

The encyclopedia is one of the most prolific sources of information that the knowledge-seeking world has access to, but owing to the rapid pace with which civilization is advancing the information found therein is often out of date. Therefore the ideal encyclopedia would be one that was revised from week to week. Also, from the standpoint of the average mechanical man, this source of enlightenment must not only be up to date but must contain an overabundance of things mechanical.

I have never been able to find a set of books on the market which fulfilled these requirements, and that is the reason why I began compiling the set, a part of which is shown in Fig. 1, that I call a "Loose-Leaf Mechanical Encyclopedia." Of course, I got most of the material from the pages of the *American Machinist*, or, in fact, my encyclopedia is the *American Machinist* bound in loose-leaf form and classified in such a way that I can find *what I want when I want it*. Also, I have

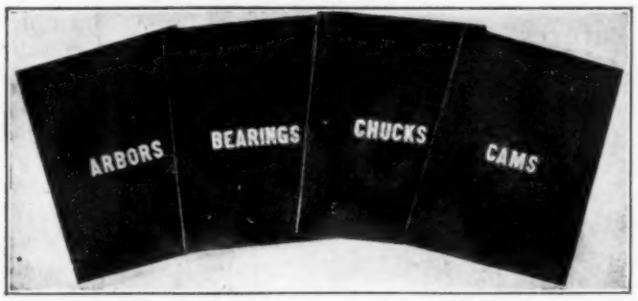


FIG. 1. THE LOOSE-LEAF ENCYCLOPEDIA

the *satisfaction* of knowing that the information I am procuring is up to date. I say up to date because I revise my encyclopedia every week.

Upon receipt of the magazine I first look through the index and mark all items in which I am especially interested. I then go through the subject matter and mark any items of interest which may have been overlooked in the index. I also thumb over the advertising matter and mark any pages that I may want for future reference.

I am now ready to bore the holes for binding, after which I remove the staples with a pair of pliers, separate the subject matter from the advertising and again separate the articles which I have marked from those in which I am not interested. The latter I file in a separate book, keeping the pages in numerical order and placing the regular index sheets in front.

Before proceeding further I might state that it is preferable to bore the holes for binding before removing the staples as the wood bit will then cut a clean hole without tearing the paper.

For this purpose I made the hardwood jig, shown in Fig. 2, to bore three ¼-in. holes for the screw-post binders shown in Fig. 3. The covers enclosing the encyclopedia are made of flexible pebble-grained leatherette and were obtained from the printer, cut to size and punched at a cost of $2.80 per hundred.

The backs shown in the center of Fig. 3 are made of the same material. They should be punched and folded to suit the thickness of the book to be bound. I usually start with only a few pages, using a short post binder about ¼-in. long and the two covers without any back.

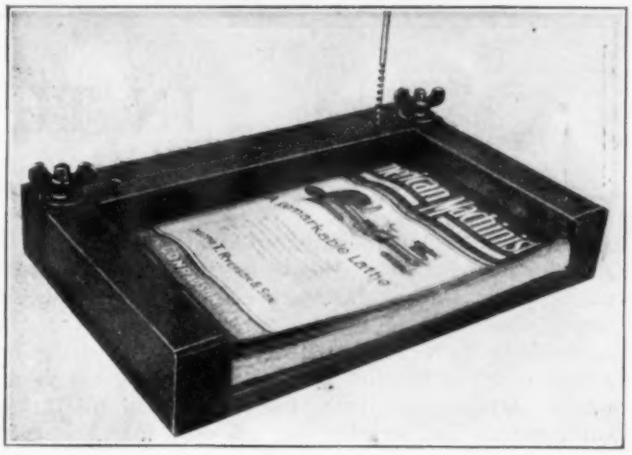


FIG. 2. A WOODEN BORING JIG

As the book grows from week to week I add the index sheets shown at the top of Fig. 3, which are made from white drawing paper with index tabs pasted on. These sheets also serve as a cross index in case two important articles which I wish to file appear on the same leaf of the magazine. For instance, on page 312 of the issue of Feb. 16, 1911, is an article describing a magnetic chuck which I filed in the book entitled "Chucks" and indexed "Magnetic." On the opposite side, page 311, is a drawing and a description of a compound die for making can tops. I also wanted this filed in the book entitled "Dies," indexed "Compound." I therefore make a note on this index sheet as shown in Fig. 3, telling where this article could be found.

By using this method of filing and indexing I am able to divide and subdivide the subject matter into its proper classification as it is a matter of only a few

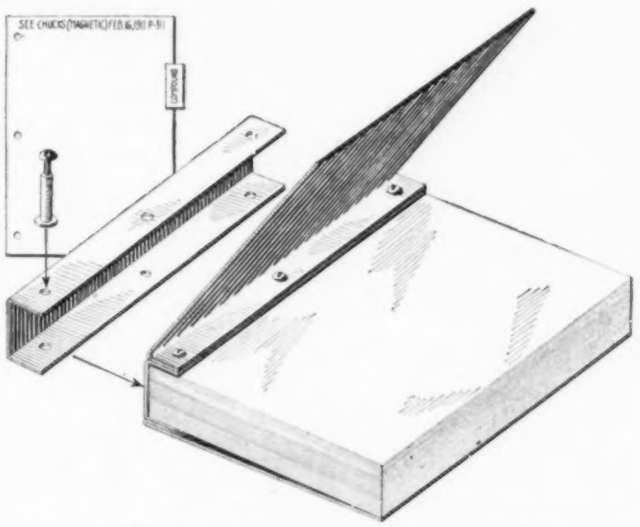


FIG. 3. METHOD OF BINDING AND THE INDEX SHEET

minutes to unscrew the post binders and insert the new sheets. For the titles I use white gummed letters ⅜ in. high pasted on the front covers.

This makes a very neat flexible book, but best of all, when I open it's covers, I find

WHAT I WANT
WHEN I WANT IT
WHERE I EXPECTED TO FIND IT
} UP-TO-DATE

IN THIS ISSUE

AFTER a brief introduction of less than a half column Associate Editor Hand, in the leading article, pushes right into a brass-tack description of tools and gages used in making phonograph tone-arms. It is probable that every man with mechanical knowledge has mused over the possible methods of turning out phonograph parts and no doubt those who read this article will feel that they owe Hand a vote of thanks for having improved an opportunity to show how at least one important part is made.

Under Special Correspondence, page 357, there is a good article on details of large airplane work. Details are important now as always, especially in airplane work, than which there is probably no work more interesting. So we'll let the details stand for themselves while we say a few things about the airplane question in its larger aspect. From time to time we have written of the future importance of the airplane both as a commercial tool and as a war machine. The nation is spending much money on battleships, little on planes. Which would you rather own in case of war—a battleship or the fleet of planes that could be built for the price of the battleship? It's high time that we get busy on bringing about such an obviously necessary change in policy and the way to do it is to show the people, who will then instruct their representatives in Washington.

As we go deeper into the subject of metal-cutting tools with DeLeeuw we realize how comprehensive is his series. We have advanced from a consideration of the cutting action of elementary tools through simple turning tools, lathe and planer tools and drills, to boring tools in general, which is the subject taken up this week, page 360. Boring tools are considered in the sense that boring is an operation of inside turning. We are told to keep in mind that in boring or inside turning the tool is presented to the inside of a cylinder instead of to the outside and that as a consequence there are new relations between the angles of the tool and the surface to be finished. These new relations are then explained.

Erwin H. Schell, in an article on industrial research in the art of man management, page 364, gives expression to a number of theories on the work of the executive. He holds that the executive's policies must be built upon experience, that each plant should develop its own standards and that all executives must contribute to administrative research. Inasmuch as we shall never know just how to handle men, because conditions are forever changing and because men change with them, there will always be new ideas on the management of men that we shall welcome.

Well known to the machinery world are both the Ford and Colvin. We have them in combination this week, page 368. There is a triple treatment, by which we mean that Colvin has written on three subjects. These are frames, differential spiders and the differential gear case.

In progressing from unsanitary and inefficient shops to the plants of today we have given very careful consideration to many things affecting product and production that our forbears no doubt passed over as of little moment. Among them is ventilation. Perhaps it is not widely known that there is legal liability for ventilation. Chesla Sherlock says that there is, so we are letting him tell about it—page 374.

We continue our comments on meeting the present emergency, page 376. We have gathered from these expressions of many manufacturers the impression that there is great confidence in the ultimate return of good business and that the present policy should be to retain the really important units of organization and build stock. There are others to hear from.

There is material in this issue on which to say much, and so we find at this point that there remains enough space only to mention Hunter's railroad article on repairing air-brake hose connections and Colvin's on the foreman and his job, pages 377 and 379.

We also call attention to the very good and true speech of George Ed. Smith, president of the Royal Typewriter Co., on the Foreign Trade Financing Corporation, page 392a. Mr. Smith says, "Until these long-term credits are available American goods will be stopped in the middle of their journeys, and a great barrier will remain in place in all parts of the world, checking the flow of American time sheets for the solution of filling American payrolls."

Coming Features

We indulged in much talk about the business we were to have, after the fighting was over, in reconstructing and equipping European industrial plants. There has been some business, but not in such volume as we expected. Next week Oliver F. Allen, formerly Major, 24th Engineers, will tell, as he sees them, the reasons why we have not done so well as we might have.

The third of the Magnetic Chuck articles will be a part of the issue next week. It deals entirely with the history of the magnetic chuck as related to Oakley S. Walker, whom She don calls "The Father of the Magnetic Chuck."

Hunter will have a railroad repair article dealing with equipment mounted on wheels. Such equipment includes traveling cranes, portable work benches, portable lathes and other apparatus.

Colvin will have an automotive article on pistons and connecting rods of the Studebaker and Essex. He will lay aside his production stories for a week in order to take up inspection.

Basset's fifteenth article on "Modern Production Methods," dealing with accounting for supplies, is scheduled for the next issue.

EDITORIALS

Watch the Quality More Closely

WE HEARD much of a letting down on quality of machine work during the war. Many shops bought machines knowing they would practically have to rebuild them before they were accurate enough to use. But there seemed to be no other way to get machines at that time.

The lack of quality, the variation from standards, was not however confined to machines. It extended to such supplies as machine screws, ball bearings, strip brass and cold-drawn stock. Unfortunately, a lot of this material is still on the market or else the carelessness as to accuracy continues.

Users of small machine screws complain bitterly of the time lost in securing screws which can be used. Standard sizes are not easy to find in stock and, when found, are so inaccurate as to be almost useless. As a concrete example, machine screws supposedly No. 2 with an outside diameter of 0.086 in. are difficult to obtain with usable accuracy. They vary as much as 0.020 in., in some cases being so small as to drop into a hole tapped with a full thread.

Strip brass, which could formerly be obtained within limits of a thousandth or less, now varies by many times this amount. The same is said of other supplies, including ball bearings and races in small sizes.

Such inaccuracies greatly increase the cost of production of the machines using them, and one of our great problems at present is to reduce the cost of manufactured products. We must get back to a sane, commercial accuracy of product if we are to maintain our place in machine manufacturing. Nothing will more quickly undermine our leadership than inaccurate and unreliable machine parts and products.

Be a Leader in Better Buying

THERE has been much bemoaning of our fate at not having a strong business Moses to lead us out of the wilderness of depression and of uncertainty. But it may easily be better for us if the emergency develops leadership, even in a lesser degree, in many. The "man on horseback" is no more desirable in business than in government.

Leadership of the autocratic variety has had its day in industry. It was in too many cases a "drivership" instead. Real leadership, which leads men to better things, which secures confidence and co-operation, will also secure production which has never been dreamed of.

Every locality has a few men to whom the rest look for leadership and suggestion. Now is the time for these men to utilize their leadership by starting a buying movement. Not indiscriminately, but in a truly thrifty manner by encouraging those whose products are properly priced. They should particularly favor those who refrained from boosting prices excessively when their products were in great demand.

Business thrift does not consist of hoarding, of refraining from buying. Thrift is rather the art of buying judiciously, of helping to keep business moving in order that our own business may keep moving along with the rest. Unless we buy the machinery and supplies we need, how can we expect others to buy of us?

Judicious buying is true business thrift—hoarding delays the return to normal buying and may bring disaster.

Automobile Design, Care and Repair

THE advent of the automobile has probably done more to spread a general knowledge of mechanics than anything which has been done in the way of educational work. There is a fascination about a self-propelled vehicle which attracts the average man and boy. Many a well-to-do business man who wouldn't think of looking at a lawn mower or a sewing machine, doesn't mind crawling under a car and studying its anatomy at close range. A drop of oil in his eye once in a while adds zest to the game.

In view of this state of mind of the average car owner, and also of the fact that the majority of owners must look after their own cars, it is up to the designer of automobiles to make vital parts more accessible and easier to repair or replace. The use of pressure and vacuum feed has made it possible to raise carburetors high on the motor so as to be more accessible. But there are still many places hard to get at, especially the oil pan or lower crankcase, the transmission, the differential and the brake adjustment, in too many cases. Oil cups and grease cups are too inaccessible in many cars, which means that they do not receive proper attention.

Square-ended pins in brake rigging which go into place nicely when you are working at the chassis from the top with no body in the way, are legitimate causes of profanity when you try to put them in place lying on your back in a dusty road. Square-ended cotter pins can also be about as mulish and contrary as any piece of machinery. Beveled or rounded ends in both cases would make it much easier all around, no matter where the work is being done.

Theoretically it may be all right to say that no owner should repair his own car, and that service stations have facilities for handling all repairs. In reality, however, many owners not only must do their own repair work but enjoy doing it. If they are mechanics they often feel that the work is more satisfactory when they do it themselves. Most of us, in fact, have been sadly and frequently disappointed in garage and service-station work.

Whether the work is done in one place or the other, however, the time required and consequently the cost to the owner, depends much upon the accessibility of the various parts. And as cost of operation plays a big part on the desirability of any car, this is a point well worth careful consideration by all builders. Simple design, substantial construction and "get-at-ability" are three points to be carefully watched by both builders and buyers.

SHOP EQUIPMENT NEWS

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and equipment

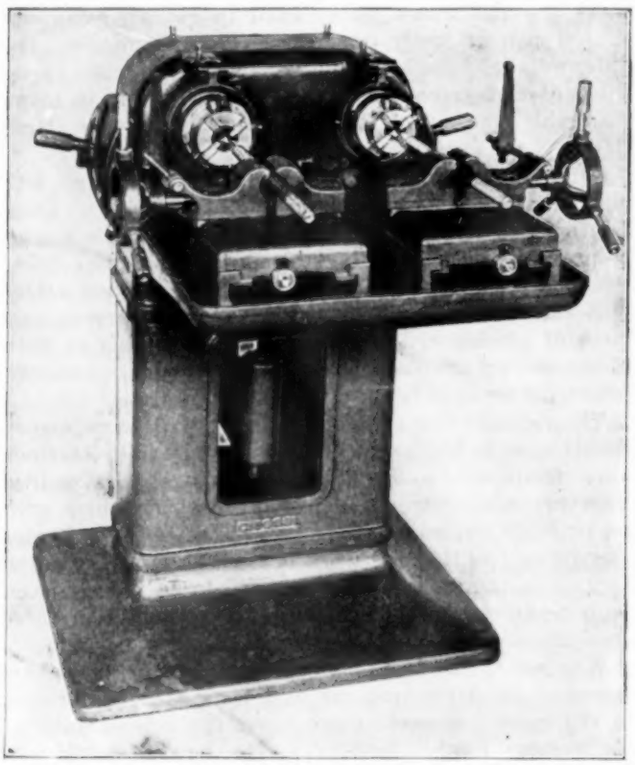
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs and equipment

Geometric Two-Spindle Threading Machine

The Geometric Tool Co., New Haven, Conn., has placed on the market a two-spindle threading machine. It is stated that a number of threading combinations are possible with the machine. Both spindles may be fitted with die heads for external threading, or may be fitted with taps for internal threading. Or, one spindle may carry a die head and the other may carry a tap. It is recommended, for tapping sizes smaller than is practicable with a collapsing tap, that the machine be fitted with a ball-drive reversing tap holder.

The bed of the machine carries two spindles, which are mounted in large bronze bearings. The spindles are driven by a single pulley, located at the rear of the machine, but may be operated and controlled independently, by means of the change gear levers at either side of the machine. The speeds are indexed according to the size of work being handled, but may be varied.



GEOMETRIC ¾-IN. DOUBLE-SPINDLE THREADING MACHINE

Specifications: Greatest length that can be cut at one setting, 8½ in.; by resetting, 14 in. Countershaft speed, 373 r.p.m. Change speed lever can be set at ¼, ⅜, ½, ⅝ and ¾ in., the spindle speeds being, respectively, 225, 150, 113, 90 and 75 r.p.m. Size of countershaft pulleys, 12x4 in. Net weight of countershaft, 140 lb. Floor space, 31x45 in. Net weight, 820 lb.

Each carriage is fitted with a two-jawed chuck operated by a handwheel. Special bushings or holders can be furnished to suit various classes of work. An adjustable swinging gage on the side of the carriage provides an accurate means of setting the work for a predetermined length of thread. The adjustable stop on the trip rod ahead of the carriage governs the opening of the die head, and the adjustable stop back of the carriage controls the closing of the die head.

A single geared pump, driven from the main shaft by means of bevel gears and a flexible shaft, forces oil from the reservoir through the spindle and die head against the work. When a tap is being used, the oil is fed through pipes located on the outside of the machine. The lubricating system may be easily removed for cleaning or inspection.

When the machine is desired for general threading and tapping purposes it is fitted with a self-opening die head, collapsing tap and a ball-drive reversing tap holder. It is stated that it is possible to have a tapping range from ⅛ to 3 in. in diameter inclusive, where the pitch of the thread is fine. The machine will cut U. S. Standard thread diameters up to ¾ in.

Changes in Cone Four-Spindle Automatic Screw Machine

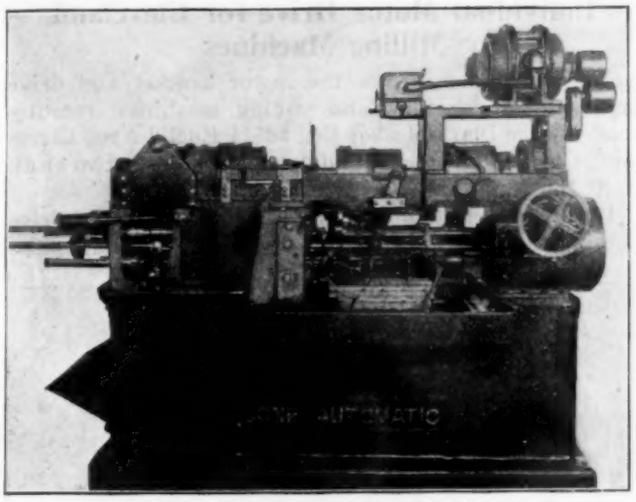
Changes in the design of the multiple-spindle automatic screw machine built by the Cone Automatic Machine Co., Windsor, Vt., have altered the appearance of the machine to a considerable extent, strengthened its working parts, and added convenience to its operation.

The principle of the Cone automatic, previously described on page 741, Vol. 47, and on page 817, Vol. 50, of the *American Machinist*, is retained in the present design.

The camshaft, from which all the movements are derived, is located at the top of the machine, where the cams can be kept free from oil and chips and are at all times conveniently under the observation of the operator.

The frame carrying the camshaft rests upon uprights that are a part of the lower or main frame of the machine and that carry the spindle turret and driving mechanism. The upper frame furnishes the support for two auxiliary spindles, while two other spindles are carried upon the turning toolslides, making four auxiliary spindles, by means of which operations of centering, drilling, inside or outside threading, counterboring, reaming, etc., may be performed.

The auxiliary spindles are independently driven through change gears that provide for various speeds, and by means of an idler gear any spindle may be run in



REDESIGNED CONE FOUR-SPINDLE AUTOMATIC SCREW-MACHINE

the reverse direction, either slower than the main spindle for die threading of large diameters, or faster than the main spindle for left-hand threading. The main spindles are of hardened and ground steel and run in bronze bearings, also ground. Spindle speeds range from 254 to 831 r.p.m. All spindles are interchangeable with those of the older type of machine. All auxiliary shafts run in roller bearings.

The turning tools are supported by slides that have bearings directly upon the bed of the machine and travel in a direction parallel to the work. Thus the tools are at all times supported directly under the cut, and there is no overhang to induce chatter or vibration.

The forming toolslides are of box-section with the outer face open, making for accessibility and ease of manipulation of the tools. The slides are unusually wide, thus providing widely separated bearing surfaces; but, being tilted up on edge, they take up little room. A tapered gib upon the upper bearing surface provides means of compensating for wear.

The base is of box section, underlying the whole machine, and has two clean-outs, one in the end and one in the rear, so that chips may be removed at any time without interfering with the operation of the machine. One end of the bed is partitioned off to provide a reservoir for oil or cutting compound, and the communicating channels are screened to keep the reservoir free from chips and sediment.

The machine has, as before, a single-speed drive, all changes of spindle speed being provided for by means of change gearing. It may be driven from a line shaft without the interposition of a countershaft, or furnished with individual-motor drive, as desired. When so equipped, the motor is mounted upon a special bracket directly above the camshaft at the right-hand end of the machine, the control box being located above and in front of the operating position, so that it may be quickly and conveniently reached by the operator. An adjustable idler keeps the belt at driving tension.

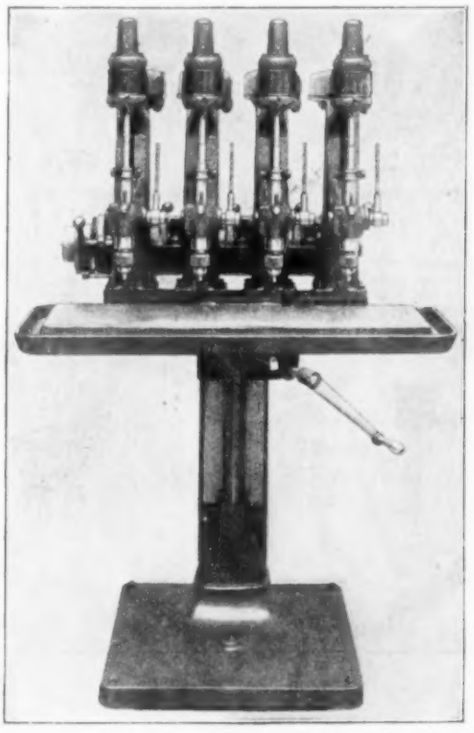
The cams, gears, and belts are all well guarded, the guards being removed in the illustration so as to show the working parts of the machine to better advantage. The machine is built in three sizes, the one shown in the illustration handling bars up to 1½ in. in diameter and producing pieces 6 in. long. It occupies a floor space of about 6 by 8½ ft. and its shipping weight is 8,000 lb.

"Pecorp" High-Speed Sensitive Drilling Machines

The Providence Engineering Corporation, sales office at 5 Nassau St., New York, N. Y., and plant at Providence, R. I., has placed on the market the high-speed sensitive drilling machine formerly made by the A. C. Mason Co., Inc., Paterson, N. J. The machine is made in both bench (Model E) and floor (Model F) types, and with either one, two, three, four, or six spindles, the illustration showing a multiple-spindle floor-type machine.

The essential characteristics of the machine are the same as explained in the description of the bench type given in the *American Machinist* on page 1030, Vol. 48. It is fully equipped with ball bearings, and the bearings and moving parts are covered, the only visible rotating parts being the driving pulley and the nose of the spindle. The drive is from the horizontal drive shaft, through gears to the vertical back shaft, and thence to the spindle through a horizontal belt, kept tight by means of a spring-loaded idler pulley.

The spindle is provided with a device for retaining the lubricating oil, a reservoir being incorporated in the sleeve, so that only occasional oiling is required. Oil which has passed through the lower bearing on the spindle is caught, when thrown outward, by the interior surface of the non-rotating sleeve, and then drops downward from the bottom of the sleeve, the object of this feature in the design being to protect the operator. Such attachments as a depth gage and an adjustment for lost motion are provided. The table is provided with a channel for catching oil and chips. The table of



"PECORP" HIGH-SPEED SENSITIVE DRILLING MACHINE, MULTIPLE-SPINDLE FLOOR TYPE

Specifications: Capacity in steel, drills $\frac{5}{8}$ in. in diameter. Drills to center of 14¾ in., circle. Spindle: diameter, 1¾ in.; travel, 6¾ in.; speeds, 3,000, 4,500, 6,750 and 10,000 r.p.m. Traverse of feed rack, 2¾ in. Speed of driving pulley, 1,800 r.p.m. Table, 12 x 14 in. Table to spindle, maximum: Model E bench type, 7¾ in.; Model F floor type, 20 in. Weight: Model E, 235 lb.; Model F, 500 lb. Multiple-head machines: distance between spindle centers, 7 in.; table size and weight increasing correspondingly for machines having 2, 3, 4 and 6 spindles.

the floor type of machine is counterbalanced, the multiple-spindle machine being provided with an elevating screw.

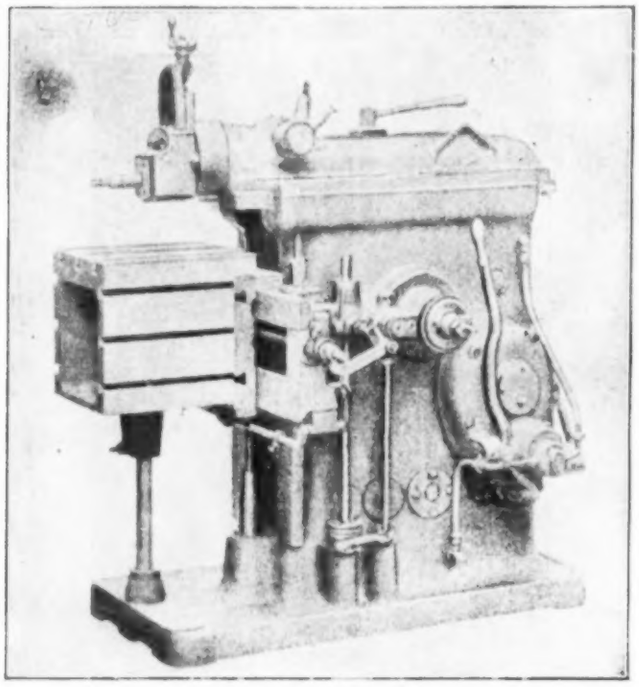
Samson Shaper

The shaper shown in the illustration is made by the Samson Works, Berlin, Germany. The following features are claimed for the machine by the maker: The gear for the link drive and its journal are not made in one piece, which necessitates the use of cast iron for both; but they are made of two parts, the journal being of steel, hardened and ground. This construction enables the gear to be fitted from above, whereby the opening in the two walls of the column, which impairs the rigidity of the machine, can be avoided. In order to relieve the journal, the gear has on the side facing the crankpin a wide tread, which is in contact with a hardened and ground cast-steel roller. In this way the pressure of the cut is effectively transmitted to the column.

The pressure of the roller against the gear can be adjusted by means of a screw.

The coupling of link and ram is not performed by a rigid joint, but is pivoted by a journal transverse to the motion of the link. The ram runs between two steel gibs. The adjustment of the feed table, ordinarily performed by the setting of the eccentric on the side of the machine, is actuated by means of the pawl. The adjustment of the telescoping connection between the eccentric or the rocker arm and pawl is avoided.

The feed during reversal of the ram is actuated by two cams fitted on the main drive gear, and is transformed into the reciprocating rotation of a vertical feed shaft by means of a completely encased train of spur and bevel gears. Forced lubrication is provided for all main parts, by means of a pump feeding a constant jet of lubricant to the main driving gear, link, rocker arm, roller and gears. The oil is collected in a trough.

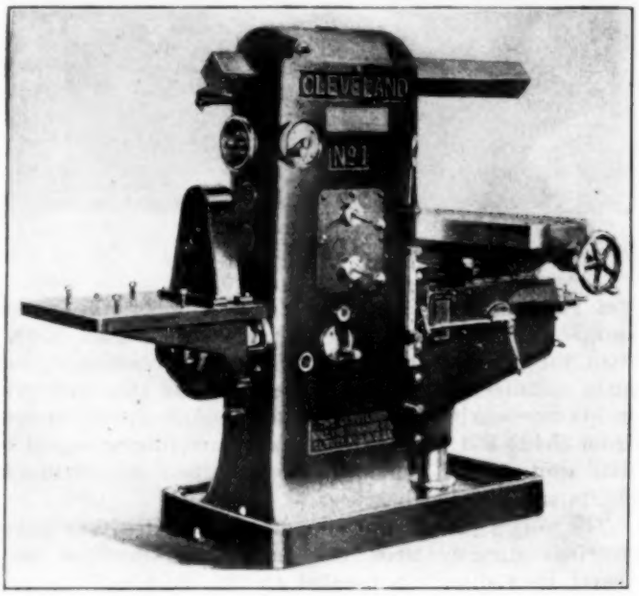


SAMSON SHAPER

Individual Motor Drive for Cleveland Milling Machines

The illustration shows the motor bracket and drive arrangement for Cleveland milling machines, recently made by the Clark-Mesker Co., 18511 Euclid Ave., Cleveland, Ohio. The bracket and drive are built in two sizes, to fit the No. 1 and No. 2 milling machines.

It is claimed that this direct-connected motor drive obtains the advantage of belt-driving by the incorporation of a friction clutch between the lower sprocket and the main drive-shaft. The grip of the clutch can be adjusted by a nut at the back of the clutch housing.



INDIVIDUAL DRIVE ARRANGEMENT FOR CLEVELAND MILLING MACHINES

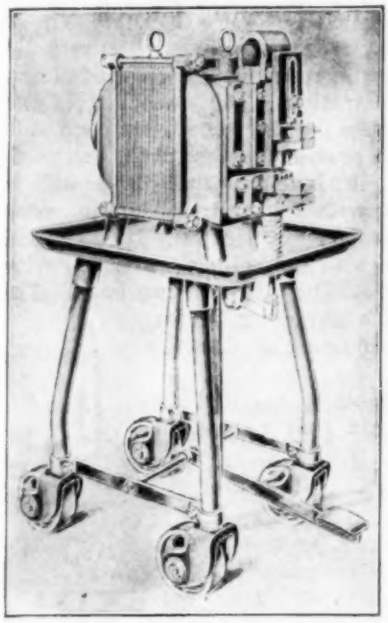
This drive can be applied to the present models of belt-driven machines by bolting the motor bracket to the column in place of the single-pulley belt-drive housing. The drive shaft sprocket and clutch are put in place of the belt pulley. The bracket is designed to support the motor high enough so that it will be free from the dirt of the floor. The sprockets and chain run in a bath of oil. A 2-in. Morse chain is used on the No. 1 machine, and a 2½-in. chain on the No. 2. The motor has a constant speed and runs at 1,200 r.p.m.

Electric Rivet-Heating Machine

The electric rivet-heating machine shown in the illustration is intended for use in the erection of steel structures, and for boiler shops, shipyards and motorcar, railroad-car and locomotive works. It is made by the Elektrische Schweissmaschinen Gesellschaft, Charlottenburg 4, Germany.

The transformer is placed on a cast-iron table resting on legs equipped with rollers. In the front of the transformer are the electrodes. The regulating switch has six steps and is encased and mounted in the rear. The switching on and off of the current, and the movement of the electrodes for feeding and removing the rivets is actuated by the treadle.

The machine is fed by a weak medium-tension alternating current, which is converted into a very strong low-tension current by the transformer of the apparatus. This latter current passes through the rivet, which is



ELECTRIC RIVET-HEATING MACHINE

put between the electrodes and is heated in a few seconds. The temperature is regulated to the desired degree by a step-switch. By using electrodes of a special kind it is possible to heat only part of the rivet, the shank or part of it, if this be desired. The maker claims great economy for the heater, because the transformer has an efficiency of 90 per cent, the heat generated is concentrated almost exclusively on the rivet, and the current acts only during the few seconds required for heating the rivet and is then automatically switched off. The process is clean and, as the temperature can be regulated, burning of the rivets can be avoided.

For heating 2 doz. 4½-lb. rivets only 1 kw.-hr. is said to be required. The machine is made in two sizes, for rivets up to ¾ and 1¼ in., respectively. The smaller size of machine heats 400 rivets per hour.

Hill Boring Tool

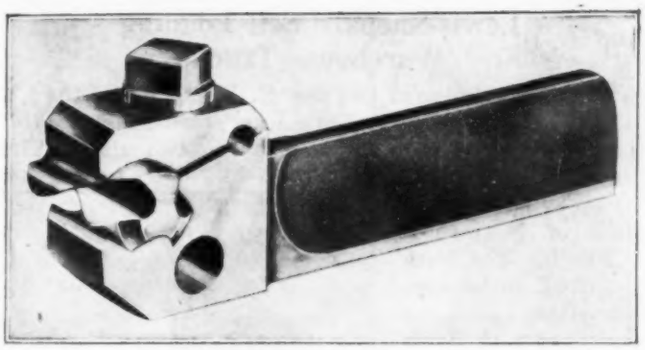
A boring tool suitable for use in bench and other small lathes is now being made by M. B. Hill, 10 Eden St., Worcester, Mass. The toolbar is held to the shank by a swinging link that permits it to be raised and lowered, to accommodate various heights of center, without throwing it out of parallel. The link is tightened upon the stud and upon the toolbar with a single screw.

HILL LATHE BORING TOOL

Three toolbars are provided with each holder. A split bushing is furnished to adapt the holder to a smaller size of toolbar. Extra bars can be made from drill rod.

Montstream "Twisto" Tool and Holder

John H. Montstream, Hartford, Conn., has recently placed on the market the "Twisto" tool and holder shown in the illustration. The device is intended for use on lathes, planers and shapers, being adapted to general machining work. The cutting tool or bit resembles a three-lipped twist drill, it being provided with three helical grooves. The cutting is done on the ends of the bit, one edge cutting at a time. There are thus six cutting edges on the tool, it being necessary only to change the position of the bit in order to obtain a fresh cutting edge. The bits are regularly furnished in lengths of 2 in., it being stated that there are 6¾ in. of length of cutting lip available for wear on each bit. When sharpening the tool, only the ends of it are ground.



MONTSTREAM "TWISTO" TOOL AND HOLDER

The bit is clamped in the holder in a horizontal position, a long bearing being provided in the holder, so that the bit is securely clamped. It is allowed to project only a small amount from the side of the holder, so that there is no overhang and the tool is very rigidly supported. The bit is secured in position and released by means of the screw on top of the clamp. The shank of the holder is ⅝ in. thick and 1¼ in. high. It is adapted to fit the toolpost of a standard lathe, and toolpost adapters and raising plates can be furnished.

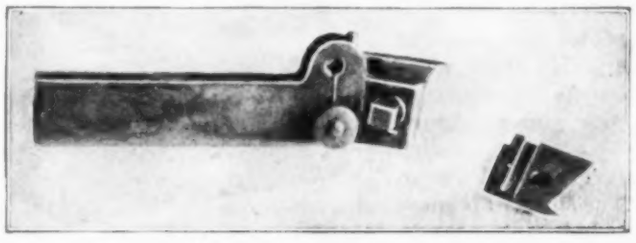
The holder is adapted for the use of disk tools. The shank of the tool passes through the hole used for the "Twisto" tool, and a strap passed through the lower hole in the holder serves to steady the edge of the disk. Disk-type threading tools can be furnished in any form desired, thus making the device adaptable to a very wide range of work. It is stated that the heavy construction of the tool and the absence of large overhang make the tool very steady.

Hill Threading Tool

A threading tool and holder that may be used either as a spring or as a rigid tool is shown in the accompanying cut. It is made by M. B. Hill, 10 Eden St., Worcester, Mass. The shank is pack-hardened. The cutting blades are interchangeable.

An adjusting screw passes vertically through the shank behind the blade, the back of the latter being hobbed to match the thread of the screw, so that vertical adjustment is obtained by loosening the clamping bolt and turning the adjusting screw.

A tapered bolt, which can be drawn up by a knurled thumbnut, fits a correspondingly tapered hole that passes transversely through the shank, and to convert the device from a spring to a rigid tool requires only that the thumbnut be tightened.



HILL THREADING TOOL

Lewis-Shepard Self-Loading Warehouse Truck

The Lewis-Shepard Co., 568 E. First St., Boston 27, Mass., recently placed on the market a self-loading warehouse truck. The truck is made in two sizes. The capacity of Model A is up to 800 lb. and that of Model B 1,200 lb. The truck is of all metal construction, and is equipped with Hyatt roller bearings. It can be handled by one man. Two side bars control the balance of the load. The hook is adjustable in two directions and may be placed in ten positions vertically and twenty-eight horizontally. It has no interfering projection back of the truck. It is stated that the handles are of such shape that the truck can be easily controlled.

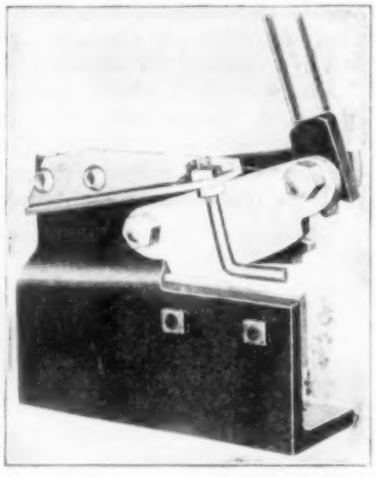
LEWIS-SHEPARD SELF-LOADING WAREHOUSE TRUCK

Specifications: Model A. Capacity, 800 lb. Extreme width, 23 in. Overall length, 57 in. Wheels, 8 x 2¼ in. Hyatt roller bearings, 1 x 2 in. Weight, 72 lb. Model B. Capacity, 1,200 lb. Extreme width, 23 in. Overall length, 63 in. Wheels, 8 x 2¼ in. Hyatt roller bearings, 1 x 2 in. Weight, 76 lb.

Chicago Steel Slitting Shear

The Dries & Krump Manufacturing Co., 2917 South Halsted St., Chicago, Ill., has recently placed on the market a bench shear, shown in the illustration, and known as the Chicago steel slitting shear. It is intended for use in machine shops, tin and sheet-metal shops, garages and factories. It will cut steel bars up to ⅜ x 2 in. and will slit steel sheets up to No. 10 gage.

The shear weighs 22 lb., this light weight being made possible by an all-steel construction. The frame is pressed from a steel section and is offset in order to allow sheets of any length to be slit. An adjustable hold-down is provided to keep the material from bending up while being cut. The leverage is obtained by means of a geared lever, the teeth of which mesh with those on the frame. The frame is 9 in. long and 6 in. high. The upper blade is 6¾ in. long x ¾ in thick, and the lower blade is 4½ in. long x ⅜ in. thick. The blades are made of crucible steel. The handle is made of pipe and is shrunk onto the casting forming the gear. The shears are made with interchangeable parts.

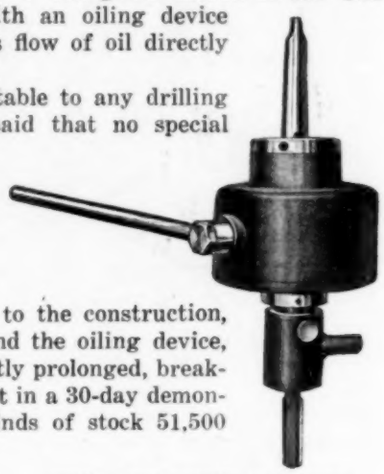


CHICAGO STEEL SLITTING SHEAR

John Reversing Tapping Chuck

The John Chuck Co., Milwaukee, Wis., has recently placed on the market a reversing tapping chuck of the type shown in the illustration. The chuck drives the tap by means of a device driving equally on each side of the tap shank. It is equipped with a five-point, positive, sensitive clutch. It is stated that the clutch is capable of disengaging within a limit of 0.001 in. when the tap reaches the predetermined depth. It has a balanced drive concentric with the spindle, reversing with a two-to-one speed ratio. The gears all run in oil. The chuck is provided with an oiling device which gives a copious flow of oil directly on the tap and work.

The device is adaptable to any drilling machine, and it is said that no special counterweight is required on the drilling machine spindle, because the chuck, having an aluminum body, is so light. It is stated that, owing to the construction, the sensitive clutch and the oiling device, the life of taps is greatly prolonged, breakage is reduced and that in a 30-day demonstration run on all kinds of stock 51,500 holes were tapped without any tap breakage. Three sets of standard tap drivers and retainers are furnished with each chuck as regular equipment. Special drivers and retainers will be made up to suit specifications, so that the device can be adapted to special work.



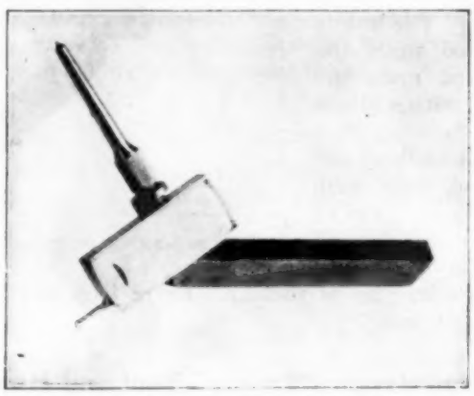
JOHN REVERSING TAPPING CHUCK

Specifications: Made in three sizes: No. 1, 0 to ⅜ in.; No. 2, 0 to ½ in.; No. 3, ¼ to 1 in. Equipped with Morse taper shanks. Aluminum body. All wearing parts hardened alloy steel.

Hill Lathe Test Indicator

The test indicator shown in the accompanying illustration is being marketed by M. B. Hill, 10 Eden St., Worcester. Mass.

It is attached to the shank by a universal joint, so that when in the lathe it may be turned to any angle. Two sensitive points are provided, one of which may be removed by unscrewing the sleeve without interfering with the action of the other. A rabbetted slide covers the amplification movement, allowing easy access for repair or readjustment. A similar device, not attached to a shank, is made for general use.



HILL LATHE TEST INDICATOR

Exporting Time Sheets to Bring Back Payrolls

Shall We Import Goods, Gold or Securities?—Long-Term Credits Are Necessary in Our Export Trade—Real Headway Is Expected of the Foreign Trade Financing Corporation

THE solution of American labor's greatest problem—unemployment—is the exporting of American time sheets to bring back American payrolls. The products of American workmanship under our present credit system can go only part of the way in reaching the foreign buyer. To reach the foreign buyer, to keep American goods flowing, American industries running, and to bring back work for the four million pairs of American idle hands, there must be provided, at once, adequate machinery for granting long-term credits in our export trade. Until these long-term credits are available American cargoes will be halted in mid-ocean, caravans loaded with American goods will be stopped in the middle of their journeys, and a great barrier will remain in place in all parts of the world, checking the flow of American time sheets for the solution of filling American payrolls.

To Finance Foreign Trade Balance

These are the views of George Ed. Smith, president of the Royal Typewriter Co., a member of the organization committee of the Foreign Trade Financing Corporation, the largest of the corporations formed under the amendment to the Federal reserve act, known as the "Edge law," which permits the formation of banking institutions for financing the exports of American goods over such periods of time as will enable the rest of the world to do business with this country.

"For more than two years," says Mr. Smith, "the business men of the country watched and waited while the time approached for providing some means for preventing the complete disruption of our export trade. Since the armistice a $4,000,000,000 trade balance has piled up, and now a further balance finds difficulty in being financed. The National Chamber of Commerce, the National Foreign Trade Council, the National Association of Manufacturers, all agreed long ago that something should be done to solve this great problem. The opportunity came when Congress passed the "Edge act," and when a Committee of the American Bankers Association formed the plans for the Foreign Trade Financing Corporation, which by its very size and its nationally representative character is expected to make real headway in remedying the chief obstacle now in the path of American exporters.

Long-Term Credits Needed

"Foreign buyers need American goods more than ever; American manufacturers, business men and farmers need more than ever to supply what the farmer wants. They have the demand. We have the goods. By supplying that demand we could get rid of that great surplus, could keep busy six days a week instead of four, and could pave the way toward a new position for the United States in the international commerce of the world.

"Why can't this be done now?

"Because the commercial banks of the United States cannot go on extending long-term loans, and further because the American dollar is at such a high premium in foreign countries that foreign buyers cannot afford to do business with us on the short-term basis customary in this country. In granting short-term credits the limit has about been reached. It is only by giving the foreign buyer more time in which to pay for his goods that we can compete successfully with the rest of the world and sell our surplus products abroad.

"Now what is the reason for this four-billion-dollar trade balance, and why is it threatening to put us out of business with the rest of the world?

One-Sided Purchasing by Foreign Buyers

"Foreign buyers since the armistice piled up this four-billion-dollar trade balance as a result of purchases which would ordinarily have been stretched out over a period of years. Normally they would have purchased what they needed, and the balance of trade kept practically level, although it was turning in our favor; but instead of taking a sufficient amount of time so that demand would balance demand, or so that we would absorb direct securities from the other side, as England and France did in the past, this balance piled up through immense one-sided purchasing on the part of foreign buyers in a short time.

"Such a thing would not have happened if this balance of trade had gradually grown in our favor rather than to be dumped upon us. We would have had a gradual balance of trade to even up, and as it was gradual we would have absorbed securities as the natural way to balance up that trade. It was not possible to educate the people of this country as to the advantage of absorbing foreign securities direct, since they had been a debtor people so long that they do not know what to do as a creditor.

To Absorb Foreign Securities

"Therefore there had to be a medium through which to absorb these securities, first investigating their worth, and then pooling them and issuing debentures based on them to the people. It has been felt that the big jump in the balance of trade, with its consequent disruption of exchange, would undoubtedly not have come if securities had been absorbed to correct it. Therefore let us consider a proposition which will absorb these securities in sufficient volume to have some effect on the balance of trade. This is the reason for the immense size of the corporation.

"Let us see whether we want securities or not. In the first place, if we do not get securities in payment for goods we have sent abroad we are going to get other goods. Do we want a tremendous amount of imported goods dumped in on us? We want raw materials that we do not produce. We want many things, such as coffee, rubber, sugar, etc., cheaper, so that we will get more of the good things of the world that we do not produce for less of our individual effort. We want imports of certain goods, but we do not want four billion dollars' worth of manufactured goods dumped into the country when we are now able to produce more of manufactured goods than we can consume. Wouldn't it be better to absorb good securities and have foreign people pay us interest? In the last analysis, we must

import goods, gold or securities to settle our trade balance. We do not want the goods—we have taken all the gold foreign people can spare—and now we stand up against a wall because we cannot absorb securities. For the present we have taken more than enough from Europe that is movable. We do not want any more. We must become, as we would have become under normal conditions—a rich investing nation, as every other great exporting nation in the past has always become.

Biggest Problem in History

"The question then is whether this country will back up its export trade. It is not a question of whether the Foreign Trade Financing Corporation itself will succeed or will not succeed. The question is whether we can get behind the proposition and by group thinking and concerted action solve one of the biggest problems that has ever confronted our country. Put in another way, the question is whether we have to depend upon a crisis to show the country that it ought to have done what the brains of the country are now telling us we ought to know.

"The problem is one which it will take an immense institution to handle. We will say now that we want to solve one particular problem, and I will lay it in front of you concretely.

Put Our Dollars to Work

"There is in Australia today a market fo American automobiles. We are not shipping them. Why? Because there is not a dollar market in Australia at this moment, and for that reason many of our men in Detroit are not working, and we are not producing the automobiles. We must create a dollar market in Australia in order to sell our goods there and keep our men working. How are we going to do it? By long-term credits. Is it right that we should have unemployed workmen in the country when we can by right action revive our market abroad? This is not being done out of charity of our hearts to help people who cannot help themselves. It is not an effort to make the League of Nations work. It is to develop the market for American products outside the United States. Why not take our dollars, put them to work, go on paying our workmen and keep up the prosperity of the country?

We Must Have Foreign Outlet

"We manufacture a tremendous amount of goods in America beyond the amount that is needed for home consumption. Naturally we cannot sell them in America. We need outside markets to dispose of them. When we cannot do this there is unemployment for the men who manufactured these goods. When all is said and done, when we export we export labor. Labor is the biggest part of all goods we export. Take the automobile. The manufacturer of this article does not make 10 per cent profit on his turnover. If he did he would be many times a millionaire. No, he makes nearer 5 per cent. Fifteen per cent of his cost goes to buying raw materials. The remainder goes into labor. In the end more than 75 per cent of his cost goes to the workman. What, therefore, we are trying to do is to take the time sheets out of the factories of America, export them, and bring back payrolls for our American workmen.

"When you finance foreign trade you only finance the time of our American workmen a bit further to its ultimate consumer.

"Let us take the automobile again. Suppose that you grant three months' credit. Where will that three months take the automobile? Make it simple. Probably to the top of the Andes Mountains, or half way across the Pacific Ocean. In three months the automobile has not reached the ultimate consumer. You haven't got it far enough toward the payroll for your workmen's time sheets.

"Some time ago we as manufacturers sat back and said to the parties in the other countries 'Come to our factory and get the automobiles, and pay us cash.' The farmer said 'Come and get my corn from the farm or the local elevator, and pay cash.' When our exports began to decline our producers relented a bit and financed their goods to the port of shipment, letting the buyer take and pay for them there. Now our exports have shrunken so far, and our available financial machinery has become clogged so much, that we cannot carry the goods any further along to the ultimate consumer. It is impossible for the foreign buyer to take goods on the terms made available by our commercial banks, and therefore we cannot sell the goods.

The People's Problem

"The explanation is very simple. We haven't the machinery to carry our work to its ultimate consumer. We used to say to the buyers 'you come and take our goods and use your own money to finance them.' Now that we can no longer do this we must either stop selling or find some way to carry our goods further along to the people who use them and consume them.

"This is not the bankers' problem alone. It is the people's problem. It requires *group* thinking, *group* action.

"Look at the people of Great Britain. They eat, sleep, work and live in export trade. There are forty million people thinking of export trade. Look at what they have done in export trade. Then wouldn't we rather have forty million people solidly back of the proposition to finance our exports than a hundred million people uninterested and unconcerned? This same thing is true of France and Germany.

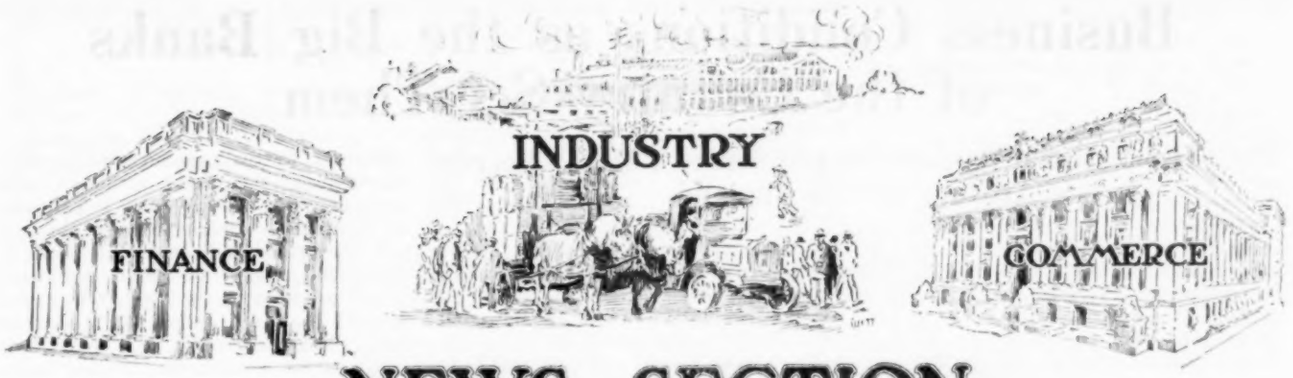
Organization the First Step

"I think that having a hundred million people, all wearing the same hats, the same clothes, the same ties, the same shoes, all eating the same things, is a tremendous advantage for any nation. It gives a standardized market for the products of the country. That gives us a great advantage in going out and selling these standardized goods in the world's markets. But this great body of one hundred million people is unorganized, and you know that an unorganized majority in many cases will not do what an organized minority could.

Education Next

"The answer is this: We must educate the people. We must bring about group thinking, making the people realize that what we are doing is putting machinery in operation which will back their payroll. We must make them understand that it is their problem. If all of us sit aside and wait for somebody else to act, the task will never be done.

"I am thoroughly convinced that what we need in this country is to think together, work together, act together, in a real spirit, and then the financing of our foreign trade will go over and be one of the greatest propositions of the world."



NEWS SECTION

The National Machine Tool Builders Meeting at Cleveland

A special mid-winter meeting of the National Machine Tool Builders Association was held at Hotel Cleveland, Cleveland, Ohio, Feb. 24, 25 and 26. It was remarkably well attended, especially in consideration of the comparatively short notice which could be given, all sections of the country being well represented.

As with the regional meetings which have been held in various machine tool centers, much of the time was devoted to the question of costs. Scovell, Wellington & Co. presented a report which was approved by the association. This report outlines a plan for standard methods of cost accounting which includes a number of items too often overlooked. It points out the necessity of considering all factors which go to make up costs, such as interest on invested capital; rent on buildings, whether you own them or not; charging off the cost of drawings, patterns, jigs, fixtures; the cost of idleness; normal burden and unearned burden, and many other points which must be considered if we are to know total costs.

The factors which enter into making a correct analysis of costs so as to fix a proper and profitable selling price include not only manufacturing costs such as previously mentioned but selling and administration costs, taxes and profits. These must be taken care of if we are to have prices which will be high enough to make a safe business and yet not so high as to induce competition.

Fred A. Geier, president of the Cincinnati Milling Machine Company, spoke on proper financing for a machine tool business. He gave interesting statistics which showed by figures compiled from 70 strong companies for the ten years prior to 1913, that the net returns averaged 9 per cent on the invested capital. While no exact figures are available on the business since that period, careful estimates seem to show 10½ per cent as the net returns, including war profits and also the deduction of taxes.

J. B. Doan, president of the American Tool Works, spoke on the general business situation paying especial attention to the possibilities of demand and the necessity of keeping our eyes open to real business conditions. The importance of proper financing was pointed out as well as the danger of not appreciating the entire situation. The danger of deceiving yourself as to true conditions is one which should be carefully guarded against.

E. J. Kearney, president of the Kearney & Trecker Company, discussed the subject of running a machine shop in time of depression. He also pointed out the necessity of proper financing and recommended the use of the budget system for keeping track of expenses as well as for keeping them within bounds. He showed a form of budget to take care of the conditions found in a machine tool shop which helped to maintain business on a sane basis under unusual conditions.

Ernest F. DuBrul, general manager of the Association, pointed out the necessity for an understanding of economics as a basis for sound business management in any line. He has outlined a program for the association which will give it a mass of valuable information along many lines, data which will give a more stable basis for future calculations both as to probable markets and proper prices.

These proposed activities may be grouped under three general heads, Technical, Marketing, and Standardization and Research. They include statistics of costs, production, shipments, financial standards and finances in general. It is not the intention of the association to undertake such technical work as can best be handled by the American Society of Mechanical Engineers, but rather to co-operate with them and other technical societies along lines which are of interest and value.

On the evening of February 24, the members gave a testimonial dinner to George E. Merryweather as an appreciation of his work as Chief of the Machine Tool Division of the War Industries Board in Washington during the war. Details of this will be given in a later issue.

It is expected that the usual Spring meeting will be held in Atlantic City at about the usual time.

Locomotive Export Association Reports Big Sales to Europe

Successful operation during the past year, under the Webb-Pomerene Act, is reported by the Locomotive Export Association, New York City, which has filed its annual report with the Federal Trade Commission.

Large foreign orders were secured in Belgium and Roumania, and executed at the American plants which are members of the association.

Before the war, Great Britain and Germany controlled the European locomotive market. But in recent years the United States has been the only country prepared to ship locomotives.

Total exports of steam locomotives from the United States in the year 1920, numbered 1,711, valued at $53,629,847, showing an increase over the exports in 1919, which were 959, valued at $30,275,728.

Importation of Machine Tools Increases

There were greatly increased imports of machine tools in 1920 as compared with 1919, as is shown by the statistics just compiled by the Bureau of Foreign and Domestic Commerce. During 1920 11,517 machine tools passed through American custom houses. On these machine tools duty was paid at the rate of 15 per cent *ad valorem*. The value of the imports in 1920 was declared to be $447,104. This is by far the largest importations ever made in a single year.

In 1919 the value of machine tools imported was only $139,619. In view of the revision of the tariff which will be made in the near future, it may be of interest to list the value of machine-tool imports during various years. In 1910 when the duty was 30 per cent *ad valorem*, the vlaue of the imports was $177,002; in 1911, $191,082; in 1912, $154,786; in 1913, $281,326. In 1914 the duty was reduced to 15 per cent. This resulted in a considerable increase in imports which in 1914 totaled $306,096, which was the record year until 1920. Since 1914 the 15 per cent duty has remained in effect. In 1915 the value of the imports was $100,596; in 1916, $132,680; in 1917, $119,408; in 1918, $274,756.

Business Conditions as the Big Banks of the Country See Them

The First National Bank of Boston Senses a More Cheerful Attitude in New England

A more cheerful attitude toward business is apparent in New England as elsewhere in the country. This feeling of greater confidence in the trade situation is based on several favorable developments during the past thirty days, although the actual, tangible improvement has been very slight. In the first place, the money condition is gradually but steadily clearing, as evidenced by a continuous rise in the Federal Reserve percentage from around 42 to 49.3. So-called easy money, freely predicted to appear about this time, has not yet materialized. Two leading reasons account for this. Surplus money is being drawn on for investment in securities in large quantities—about $200,000,000 so far this year—and much of this is destined for permanent improvements. More important, however, is the very slow liquidation in business loans which were made when commodity prices were high and which are being slowly whittled down as inventories are reduced on the present comparatively low scale of prices. Stated differently, bank deposits which reflect current operations of business have been falling in harmony with lower prices of goods fully as fast as it has been possible to reduce outstanding loans during the present period of slack business. The strain on the banks therefore remains undiminished and money rates continue firm.

Although the time element has been quite generally underestimated, the tendency is in the right direction, although easy money seems still months away. Another feature, negative in character, is the January record of failures in this country and abroad. While fears of a disastrous panic had practically vanished last year-end, many fully expected a huge crop of failures, including important houses. Persistent rumors were circulated concerning the solvency of well-known companies—the more important the company, usually, the more persistent the rumors. This atmosphere has been dispelled. As a matter of fact, January failures were greater in number but less in liabilities than December, the heaviest month since June, 1914. The outstanding basic development of the past few weeks has been an improvement in the movement of raw materials to market, including grain, live stock, cotton and wool, and a freer exchange of manufactured goods, which has resulted in a considerable increase in business activity. That profits are very unsatisfactory is secondary; the prime thing is to move goods, and that fact is the foundation of the more optimistic feeling now prevailing. Deflation is proceeding steadily, prices generally receding and now reaching practically every item on the list. The process has, in recent days, affected the great steel industry, the independents having reduced prices below the corporation's level and made a start in wage reductions. The dominant factor making for a slow recovery in business is the unbalanced status in the process of deflation, with some commodities being quoted below prewar and production costs, while others have been as yet affected slightly, if at all.

When the various commodities approach their normal exchange value as compared with other commodities, a quickening in business can be confidently expected. Meanwhile revivals in those industries which have been thoroughly liquidated are taking place and account for the increase in activity in this section. New England was first to feel the shock of deflation; similarly, improvement in business has first appeared in this manufacturing community.

Our Foreign Trade in 1920

Though the foreign trade of the United States reached record heights for 1920, there is a general conviction among exporters and importers that the figures for the year, and more particularly for the month of December, fall far short of reflecting the present condition of the country's foreign trade, according to the Guaranty Trust Co.'s semi-monthly international trade survey, "American Goods and Foreign Markets." Regardless of what circumstances may have contributed to maintain the large volume of exports, the bank says, it remains obvious that a sound trade cannot continue indefinitely on the short-term credit basis which has characterized our foreign business during the last year.

The survey analyzes last year's trade, in part, as follows: The 1920 figures demonstrate, of course, that our customers overseas are in such immediate need of our goods that obstacles of prices and exchange conditions have somehow been, to a large degree, surmounted. But, what is of more vital significance, they further demonstrate the need of American producers and manufacturers for markets for their goods. Business under last year's conditions, however large in volume, cannot be permanently maintained.

December has added more than $400,000,000 to the already vast favorable trade balance of the United States, and coming months will witness further additions to the amount due us from the rest of the world, although cable reports just received from Department of Commerce representatives throughout the world indicate some improvement in general economic conditions since the first of the year, which may have a salutary effect on our trade with certain countries. In Great Britain progress in deflation is seen, speculation is decreasing, bank loans are increasing, and there are predictions of further rise in sterling and a lower rate on silver. Also, American money is reported to be flowing into England for investment. Some general improvement is also reported in Belgium and the Scandinavian countries, but in other parts of the world the department representatives report conditions essentially unchanged.

Analysis of the 1920 foreign trade figures shows that commerce with Europe, our oldest and best customer, has fallen off seriously in the last year, though our total foreign trade increased as a result of greater business with Canada, Mexico, South America and Asia. Exports to Europe fell from $5,185,980,000 in 1919 to $4,466,655,000 in 1920, while imports in the same years increased from $750,569,000 to $1,227,842,000. A four-fold increase in our trade with Germany is significant in considering the general European decline in trade.

American exports to the four principal South American countries increased more than $100,000,000 as compared with 1919, while imports showed an increase of only about $25,000,000. Trade with Cuba exceeded $1,200,000,000 in value in 1920, an increase of nearly a half billion dollars over 1919. Exports to Mexico increased about $75,000,000, while imports rose from $32,000,000 to more than $180,000,000. The value of our trade with China increased about $80,000,000 in 1920, divided almost equally between imports and exports. Trade with Japan, however, increased only about $16,000,000, of which $11,000,000 comprised exports to that country.

The currents of this country's commerce during 1920, and the enormous total value of our goods shipped to new markets, despite exchange drawbacks and lack of credit, serve as evidence of the almost unlimited opportunity for the expansion of foreign trade on a firm and permanent financial basis.

But the American people must thoroughly understand that the extent of this expansion, as well as the rehabilitation of our waning European markets, will be measured by the extent to which they co-operate with institutions that are in a position to place long-term credits at the disposal of countries in constant need of our surplus products.

National Bank of Commerce in New York Says Profitable Business Is Possible on Declining Market

Business sentiment is somewhat mixed, and while in some lines there is improvement, all signs indicate a period of hand to mouth business, based upon immediate requirements for prompt delivery. Whatever opinion may have been entertained a month or two months ago, it is now clear that the process of placing business upon a level fairly comparable with that which prevailed prior to 1914 is in progress. The process will be hastened by the readjustment of those basic commodities which have as yet remained almost untouched by the movement toward lower prices. Particularly is this the case with regard to iron and steel, the necessary materials for practically every industry.

Retail prices and labor costs have not kept pace with falling commodity prices. Labor costs must be readjusted to new price levels in an orderly fashion with the greatest possible recognition of the social problems involved. Viewing the matter as a whole, further lowering of retail prices must come before the business situation can be said to be once more in stable equilibrium. Retail prices, as is usual on a falling market, have lagged behind the downward movement of wholesale prices and their adjustment has been delayed by the introduction during the past few years of a temporary speculative element into the circle of distribution. These speculative middlemen, who for the most part serve no economic purpose, have largely been eliminated by rapidly falling commodity prices, but the effect of their presence is still felt to some extent in the unduly high cost of much of the present retailers' stocks, as well as in a general lowering of the standards of commercial morality and a disregard of trade conditions.

It is difficult to conduct business at a profit in a period of sharply declining prices. Precipitous declines in commodity markets are believed to be passed, except in the case of iron and steel and a few other commodities where the full forces of readjustment have not yet been felt. Even with a continued declining tendency, normal business at a satisfactory profit is entirely possible. The enormous expansion in the United States during the thirty years following the Civil War was carried on in just such an era of gradually declining prices.

It is time to come absolutely to a realization that the period of semi-speculative business in staple lines has passed. Not only must the machinery of trade be readjusted to more normal price levels, but there must be a return to the mental attitude of the time when strict integrity and a broad and thorough knowledge of trade conditions were recognized as among the necessary assets of the well-established business.

The inability of Europe to buy will continue to be a major factor for an indefinite period. This is directly reflected in the raw material markets of every country which is dependent on the European market to any important degree and indirectly in the export markets for manufactured products of every class. It is important in connection with the European situation that the effect of the establishment of an export business on a long-time credit basis should not be misunderstood. In the face of the present shortage of capital the sale of raw materials on any other terms than cash or an exchange of commodities does not alter the immediate situation. The sole result is the substitution of one kind of obligation for another. In other words, it will require years to make up not only the actual capital destruction which resulted from the war, but also the loss in capital accumulation and the disorganization of productive activity which resulted from it. American business should frankly recognize this condition. A reasonable export business can be done with due regard to established credit standards, and business on any other basis is undesirable. There is neither formula nor legerdemain by which poor credits become good, nor means whereby large business can be done with those whose credit does not permit or warrant such transactions.

Money Rates

Government demands as well as prospective corporate and individual borrowings together with the considerable proportion of credit still unliquidated will prevent any permanent easing of rates for the present. Somewhat easier conditions should prevail until the end of February when demands for funds to make income tax payments due March 15 are likely to result in another stiffening of money rates.

Wholesale Prices

Further substantial declines in commodity prices have occurred during the period Jan. 16 to Feb. 15, including both raw materials and semi-finished products. In the cotton and grain markets, prices which appeared to have reached a position of at least temporary stabilization just after the first of the year, have suffered new declines. Steel and petroleum prices which hitherto resisted the downward movement in other markets, began during the period under review to follow the course of other commodities. The slight improvement noticeable after the first of the year in the movement of wool and hides has not been sustained and in many grades of these commodities it can scarcely be said that a market exists at any price.

Railroads

December earnings for the most part continue disappointing, a reflection of the traffic slump which resulted in a surplus of 323,376 freight cars for the week ending Jan. 29, the latest period from which data are available. This is the largest number of idle cars reported by the railroads of the United States in ten years. The passage of legislation empowering the Treasury to make partial payment to the companies of the amounts due them under the terms of the government guarantee would materially aid many of the roads and substantially benefit the general credit situation by enabling the roads to settle outstanding accounts and make new commitments for materials. The final status of the railroads, however, depends upon the adjustment of railway wages to a scale commensurate with decreases in effect in other industries.

U. S. Chamber Approves Incorporation of American-Chinese Companies

The Foreign Commerce Department of the Chamber of Commerce of the United States has made public two principles it has approved looking to the federal incorporation of American companies doing business in China, and their exemption from certain taxes that other foreign companies do not have to pay. These principles are as follows:

"American companies formed primarily for China business and operating in China should be given the privilege of federal incorporation in order that they may have a standing as American companies, under a single set of legal requirements and regulations, which it has been difficult for them to get and maintain when operating under the laws of the individual States, the requirements of which vary and are not generally known in China.

"Such American-China companies, so far as taxation is concerned, should be placed on an equal footing with the companies of other competing countries."

This matter was brought to the attention of the National Chamber by American chambers of commerce in China. These chambers contend that federal incorporation is sought in order that companies made up and managed by Americans, in which more than fifty per cent of the enterprise is controlled by American capital, may operate under a single set of clearly understood requirements. For the success of a China business, it is pointed out, it is often advantageous to encourage Chinese capital to come into the corporation with American capital. In order to gain the confidence of the Chinese investor and of the Chinese business man who may enter into contractual relations with the corporation, it is regarded as most important that companies should operate under a single set of known requirements, rather than under the varying regulations of the individual states.

The question of exemption from federal and state income taxes and excess profit taxes on such corporation is of very immediate importance, these chambers of commerce and American

business men in China point out. American companies are meeting with hard competition in China, especially from British companies, for British laws have recognized the special requirements of the China situation, and have made it possible for British companies operating in China to do so without paying corporate taxes in England. American companies are at a distinct disadvantage in competition with such British companies, and apparently are at a similar disadvantage in competition with French and Japanese companies.

International Association of Machinists Urges Trade With Russia

The International Association of Machinists will exhaust every effort to carry through its plan to assist Russia in securing in this country such locomotives, tractors, machine tools, and other supplies as it is willing to pay for. E. C. Davison, the secretary of the Association of Machinists, discussed the matter at length with the Washington correspondent of the *American Machinist*. He is anxious to secure the co-operation of machinery manufacturers, machine-tool manufacturers, and others who would benefit by an increased demand.

The position of the Association of Machinists, Mr. Davison explains, is simply to act as an intermediary between the Russian groups desiring to buy machinery and the American interests that have machinery to sell. This service is to be performed without profit to the Association of Machinists, the main objective being to provide more employment for American machinists.

The Russian negotiations which the Association is conducting are only a part of the activities of the organization looking to the expansion of the foreign market for the product of machinists' work. With the cards falling throughout the world in a new deal, Mr. Davison believes that an excellent opportunity is presented to expand our foreign markets. In this movement, he says, he has the co-operation of a large number of American machinery manufacturers. He admits that some manufacturers have expressed disapproval of the Russian plan but he believes that a thorough understanding of the situation on their part would remove any doubts they may have. In this particular as well as in many others he believes that the interests of the manufacturers and the Association are parallel. He is convinced that the ability of the average American machinist is markedly higher than the average ability of the machinists in any other country. That fact combined with American business enterprise should make it possible to expand greatly our foreign trade.

So far as the Russian plan goes, Mr. Davison admits that there are difficulties to be overcome in arranging the financing. He is hopeful, however, that the obstacles can be removed. He is opposed to any censoring of the gold imports into the United States. He knows of no case where gold from Turkey or from any other country has been refused on the assumption that it may be tainted. It is his opinion that such a question necessarily must be worked out within the nation from which the gold comes.

Mr. Davison admits that there are differences of opinion in his own organization as to just what course should be pursued in the Russian matter. Some object strenuously to the proposal but he is trying to assure all concerned that any negotiations entered into by the Association will be thoroughly honest and above board. He believes it to be very necessary, however, to take prompt action in Russia before the opportunity offered there is seized by some other nation. He has on file numerous reports showing that the Russian requirements for machinists' products are very great.

Evolution of an "American Machinist" Article—IV

The *American Machinist* copy editor is shown in the illustration herewith doing his bit to polish up any rough spots that the associate editor may have missed. Everybody makes mistakes and only the constant checking up which an article receives before being published

insures its correctness. The ex-lieutenant shown here is responsible for all grammatical and typographical errors; hence, from now on if you discover any you'll know where to place the blame. Besides being copy editor he assists on news articles and occasionally draws cartoons. On the opposite page he tells you of his nightmare.

To Repeat Course in Boxing and Crating

The practical course in boxing and crating, which has been established by the Forest Service of the U. S. Department of Agriculture, will be repeated during the weeks of March 7 to 12 and May 2 to 7. The course is conducted in the Forest Products Laboratory, Madison, Wis., and is in charge of J. A. Newlin and C. V. Maudlin.

Chamber of Commerce Demands Repeal of Excess-Profits Tax

An almost unanimous demand for the repeal of the excess-profits tax has been made by the membership of the Chamber of Commerce of the United States in a national referendum vote, the result of which was made public in Washington on Feb. 27. The ballot was taken on a report of the Chamber's Committee on Taxation advancing fifteen proposals for changes in the present method of Federal tax levies.

Although the committee recommended substitutes for the excess-profits tax, the vote of the Chamber's membership on these proposals was not conclusive. A considerable majority voted against an increase in income taxes, proposed as a means of substituting some of the revenues derived from the excess-profits tax, and at the same time there was a majority vote against any form of sales tax.

A proposal that excise taxes be levied partly to take the place of the excess-profits tax was carried.

In the Chamber's referendum system a two-thirds vote is necessary to carry. The propositions submitted and the vote on each follows:

1. The excess-profits tax should be repealed—for, 1,718; against, 44. Carried.
2. Revenues now derived from the excess-profits tax should be obtained mainly from taxes on incomes—for, 571; against, 1,004. Not carried.
3. There should be excise taxes upon

some articles of wide use but not of first necessity—for, 1,217; against, 504. Carried.

4. Should a sales tax be levied instead of the taxes mentioned in propositions 2 and 3?—for, 704; against, 855. Not carried.

5. Should a sales tax be levied, in addition to such taxes as are mentioned in propositions 2 and 3?—for, 763; against, 894. Not carried.

6. Members voting in favor of question 4 or question 5 are requested to indicate the type of sales tax they advocate:

a. A general turnover tax—for, 511.
b. A limited turnover tax—for, 180
c. A retail sales tax—for, 541.

7. There should be a moderate and graduated undisturbed earnings tax on corporations—for, 640; against, 1,063. Not carri d.

8. Each individual stockholder of a corporation should pay his own normal tax—for, 693; against, 975. Not carried.

9. Income from any new issues of securities which may lawfully be made subject to Federal tax should be taxable—for, 1,386; against, 275. Carried.

10. American citizens resident abroad should be exempt from the American tax upon incomes derived abroad and not remitted to the United States—for, 1,252; aganist, 456. Carried.

11. Profits arising from sales of capital assets should be allocated over the period in which earned and taxed at the rates for the several years in the period—for, 1,411; against, 243. Carried.

12. An exchange of property of a like or similar nature should be considered merely as a replacement—for, 1,547; against, 142. Carried.

13. Net losses and inventory losses in any taxable year should cause redetermination of taxes on income of the preceding year—for, 1,350; against 323. Carried.

14. Ascertainment by the government of any tax based on income should precede payment—for, 1,215; against, 749. Carried.

15. Administration of income taxation should be decentralized—for, 1,321; against, 390. Carried.

The vote makes it clear that business men are united in their view that the excess-profits tax hampers business operations and retards the progress of readjustment. Among the objections to the tax as pointed out by the committee are that it produces inequities; that it is difficult of administration; that price reductions will decrease revenues from this source, and that the tax encourages extravagance.

A striking reaction was shown in the vote against increasing income taxes. It was obvious to the voters that such increases would fall on the middle class of incomes, since little more can be derived from smaller incomes and because taxes already are so high on the larger incomes that those receiving large incomes are investing in tax-free securities and thus defeating the purpose of the tax.

New Officers of Concrete Mixer Association

At the annual election of officers of the Concrete Mixer Association of the United States recently held in Chicago, Clifford F. Messinger, general sales manager of the Chain Belt Co., Milwaukee, was elected president for the coming year. W. B. Knickerbocker of the Knickerbocker Co., Jackson, Mich., was elected vice-president. A. T. Scannell of the Archer Iron Works, Chicago, Ill., was elected treasurer.

1920 U. S. Foreign Trade

The U. S. Department of Commerce has announced that America's foreign trade in 1920 was the largest in the country's history, totaling $13,507,000,000. Exports were valued at $8,228,000,000 as against $7,920,000,000 in 1919, and imports at $5,279,000,000.

Peru to Have Exhibit of Foreign Manufactures

The following communication has been received from Eduardo Higginson, Consul-General of Peru, New York:

"I wish to inform you that the Peruvian government will this year celebrate the centennial of Peruvian independence, and for this purpose has voted the sum of £600,000, or approximately $3,000,000.

"In connection with the centennial it has been arranged to hold an exhibit of manufactures of other countries and to this end the Peruvian government has granted concessions to the Peruvian Centennial Exhibits Co., 42 Broadway, New York, and A. Smeraldi, Lima, Peru. Information relative to the allocation of space can be obtained from the above-mentioned.

"It is needless to point out that the opportunity presented to American manufacturers and merchants is not likely to again occur for a considerable length of time. The buildings in which the two expositions are to be held will very probably be centrally located in the city of Lima and the exposition itself will undoubtedly be of great interest to consumers and merchants throughout Peru."

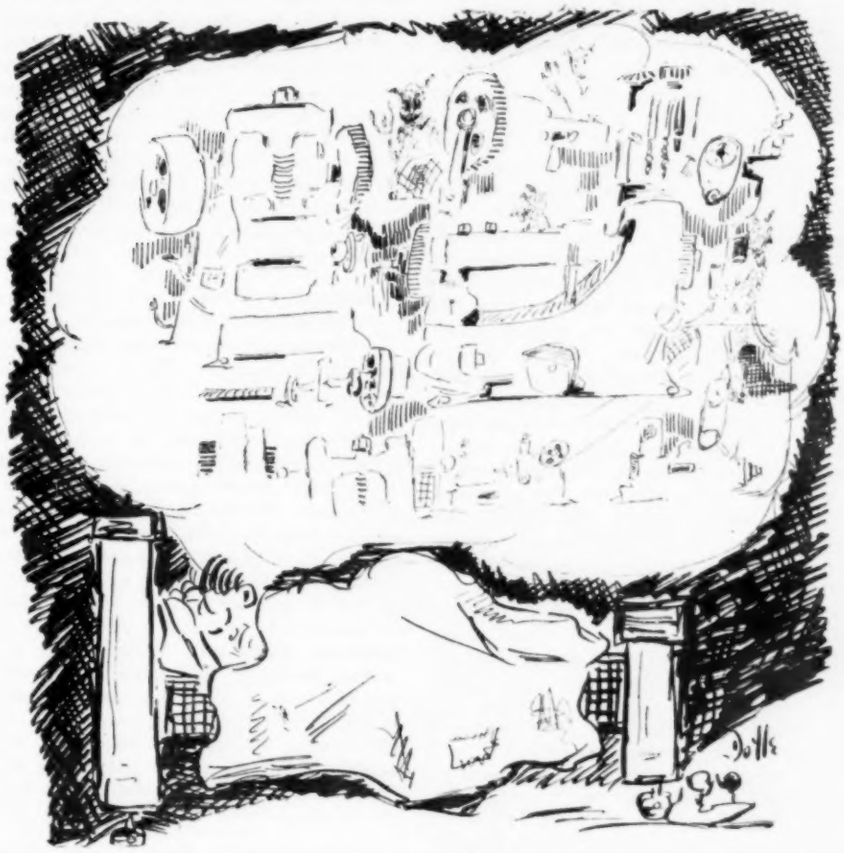
A. S. T. M. Issues Statement

The American Society for Testing Materials, Philadelphia, Pa., has issued a statement of the work of the Joint Committee on Investigation of Phosphorus and Sulphur in Steel. This is the third statement that has been issued, the second having been distributed in May, 1920.

The Nightmare of the "American Machinist" Copy Editor

The machine shown in the accompanying illustration is put out by the Blankety-Blank Tool Co.

It is a multiple-spindle, 4-jaw, double-sprocket, single-arm with back gears connected to a shaft in the coolant pump which is run by a set of helical gears meshing with the sliding head on the automatic treadle and indexed to the case-hardened hand wheel running in a bath of oil supplied by a chain-driven, sandpaper diskwheel welded to a set of belt shipper forks which



engage a gang of cutters on the crossbar, thus assuring correct alignment of the base flange on the manifold and containing the valve-stem bushings for indexing the hardened steel guide pins attached to the special tool-guide bearing, serving as an automatic stop for the drilling operations of the horizontal, radial thermodynamic setscrew which locks the drop-forged direct current sandblasted handwheel at the left of the ball-and-socket-joint crankpin blowoff capscrew, making a complete cycle with the electrolytic polyphase wormwheel and finished reamed in a home-made hot-drawn, hydro-electric gear-cutter locknut with a set of rocker arm pipe tongs V-connected to a self-contained standpipe in the wheelbase.

Senators Norris and Reed on the Government Employee Section of Patent Office Bill

Several efforts on the part of Senator Norris, of Nebraska, to secure the approval of the conference report on the Patent Office bill have failed and, at this writing, it is believed that he will abandon the section of the bill which authorizes the Federal Trade Commission to administer patents for employees of the government. The Senate is willing to approve that portion of the bill which increases the salaries of the technical men in the Patent Office and which allows the expansion in the size of the present force. The House already approved the conference report including the federal employee patent plan.

Senator Norris, in explaining the controverted section of the bill, says that it simply allows any employee of the government who has made an invention or obtained a patent to turn it over, if he desires, to the Federal Trade Commission. That commission is authorized to license corporations or individuals to manufacture patented articles on the terms fixed in the lease. The license fee is to be paid into the Treasury of the United States. Out of that sum the President is authorized to give to the employee who made the invention what, in the opinion of the Chief Executive, is a fair and proper compensation to the inventor.

Senator Norris pointed out that experimentation is necessary after an invention may have been secured based on an achievement in a laboratory or on a small scale. When something novel is developed by a government employee it is open to the public. The co-operation of some private activity is secured to perfect its manufacture on a commercial scale. As soon as its merit is proven the invention is open to competitors, who get the same advantage as does the concern which expended time and money for the experiments. The result is, Senator Norris continued, that most of these inventions are not developed. He stated that the hearings disclosed that an inventor may be absolutely robbed of his patent under existing law unless he has sufficient money to carry litigation to the Supreme Court of the United States. He stated that patent attorneys agree that the only thing that an inventor who is not wealthy can do when his patent is infringed by someone with means is to sell his patent for whatever he can get, because otherwise he would be worn out in the court, even though it were conceded that his patent is valid. Some powerful companies, he declared, find it very profitable to suppress patents so as to prevent competition in their line. "The government gives a monopoly to an inventor," said Senator Norris, "on the theory that it will be used by the public. Sometimes there are interests who can make more money by suppressing a patent than they can by utilizing it. There are thousands of patents being suppressed and have been suppressed for years. The very monopoly that the people give for their own benefit is used to their detriment and expense."

Senator Reed, of Missouri, stated very frankly that the bill would not pass with the government employee provision in it if he can prevent it. "If I draw a government salary," declared Senator Reed, "and John Smith is working in a garret I ought not to take any advantage over John Smith because I have a government place. This is an attempt to take a class of persons already in the employ of the government and put them under a particular governmental protection and to do that when, as a principle of equity, their inventions made through their contact with the government business, for which the government pays them, ought by right to belong to the government. I am willing, however, to permit a government employee to take out a patent because it stimulates them to exertion, but when he takes out his patent he ought to stand on the same footing as do other persons.

"So far as I am concerned I am not going to pay the price of putting the patent business into the hands of the Federal Trade Commission or into the hands of the President. I am not going to favor the principle of licensing by the federal government. It means special licenses to special people, and in this case a board as incompetent to pass upon patents as I am to pass upon music. The Federal Trade Commission has been a failure in everything it has undertaken, except the mere collection of statistics, and those have to be checked up."

Japanese Steel Works Buys American Equipment

Seventeen carloads of electrical equipment for steel mill operation were recently delivered for installation with what is stated to be the first electrically driven steel blooming mill, to be erected in connection with the plant of the Imperial Steel Works of Japan, located near Tokyo, according to the *Indian Trade Journal*. The mill will be capable of rolling steel ingots measuring 500 by 500 millimeters and weighing 3,000 kilo-normal, or 5,000 kilo-maximum. It will be operated by a 35,000-hp. single unit motor of the reversing blooming mill type, taking direct current at a voltage of 600 and operating with a speed range up to 100 r.p.m. To supply power to the motor a flywheel motor generator set of 2,800 kw. capacity, 600 volts d.c., 368 r.p.m. is to be installed.

Insures Its Employees

The Leland-Gifford Co., of Worcester, Mass., manufacturer of machine tools, etc., has insured its employees through the Ætna Life Insurance Co., of Hartford, Conn. The policy on each employee varies in amount from $500 to $1,000, according to length of service. The amount of insurance is approximately $300,000.

British Governmental Support of Privately Owned Airplane Companies

Last summer while in England it was the privilege of a correspondent of the *American Machinist* to attend a meeting where the possibility of obtaining government assistance for privately owned airplane companies was the subject of discussion. As he was a guest of the committee it was understood that he should be silent as to what was heard. A communication from London was, however, recently received, which releases him. It runs as follows:

"It is announced by the air ministry that the cabinet has approved, subject to parliamentary sanction, the grant of a sum for the direct assistance of civil aviation. The ministry states that during the financial year, 1921-1922, payments under the grant will be limited to a maximum sum of £60,000 and will be made to British companies operating on approved aërial routes. The amounts to be paid will be calculated subject to the above limitation in regard to the total sum available within the year, on the basis of 25 per cent of the total ascertained gross revenue of each company (exclusive of the government grant) earned by the carriage of passengers, mails and goods on and after Jan. 1, 1921.

No differentiation will be made with regard to the class of load carried and payments will be allotted on the return for each period of three months treated separately, provided that the company can show that a minimum of 45 days in each period of three months (or such other factor of regularity as may be determined later by the air council) flights have been completed in both directions by aircraft of British manufacture fitted with British made engines within a fixed minimum period of time allowed for each journey.

The routes at present approved are London to Paris, London to Brussels, and London to Amsterdam. Extensions to these routes and additional routes, such as England to Scandinavia, on which the possibilities of a service employing flying boats or amphibian machines or a mixed service of sea and land aircraft can be demonstrated, may be approved from time to time if satisfactory proposals are received by the air council.

The maximum time allowed for journeys between London and Paris, between London and Brussels and between London and Amsterdam will be four hours from airdrome to airdrome (or such other time limit as may be determined later by the air council).

Payment of the grant will be subject to the production for departmental inspection, when required, of such accounts and records as the air council may deem necessary. Any British company intending to run on the routes and notifying the air council of this intention will become an 'approved' organization by fulfilling the conditions laid down."

It will be noted that there is a great

deal more to this than merely the subsidizing of privately owned airplane companies although that in itself is sufficient to commend it to most thinking men.

The companies must be British, British airplanes must be used and they must be equipped with engines of British make—all of which will mean work for a number of men.

The trained staffs of these companies will be available to handle war planes and to instruct others should such a contingency arise.

Let us hope that the United States government may take a hint from this and do something before all our war-trained aviators have died of senile decay.

Director of Naval Aviation Warns of Disaster to Aerial Defenses

Disastrous curtailment of our aërial defenses, particularly at the Panama Canal and along the Pacific Coast, is inevitable under the naval appropriation bill, now before the Senate, according to a statement by Captain T. T. Craven, director of naval aviation, today.

The appropriation bill as it passed the House carried $6,915,431 for naval aviation and stipulated new development for which no money was provided. Other bills which have been proposed call for the construction of aircraft carriers at a cost of $35,000,000 each, but make no provision for the design or manufacture or development of the equipment which they are to carry.

The current appropriation bill virtually amounts to the destruction of naval aviation, said Captain Craven, and its destruction will mean perhaps a fatal blow to commercial aëronautics and the aircraft industry, without which it is not practicable to have adequate aërial defense. It will require from a year to a year and a half to begin to obtain equipment, he said, even if appropriations were immediately available.

"Unless the Senate increases the naval aviation appropriation," said the director, "we will be compelled to relinquish Coco Solo, the naval air station from which the aërial defense of the Panama Canal is conducted. Cessation means exposure of the canal to attack from the air; and if attack ever is made it is certain to be made first through aërial bombardment.

"The aviation detachments serving with the Atlantic and Pacific fleets cannot be maintained. Present equipment consists for the most part of planes left over from the war. Under the bill as it now stands we have not sufficient funds to install modern radio on these planes. The planes themselves, for the most part, will have to be junked before the end of the year.

"The project to construct one of the world's largest dirigibles—the ZR-1—in the United States (work on which had already begun) will have to be abandoned. Competitions in naval aircraft design which were entered into by the American aircraft industry will be terminated. The result will be serious embarrassment, possibly fatal injury, to the lighter and heavier-than-air aircraft industries in the United States, to which we must look for the development of our designs and the manufacture of our equipment.

"Even the operation of the great rigid ZR-2, purchased abroad at a cost of $2,500,000, will be limited to the Atlantic coast, as the plans for an airship terminal in southern California will be killed. This means that the Pacific coast will be deprived of the principal element in long-distance aërial defense.

"The proposal to establish within the Navy Department a Bureau of Aviation is in danger of being sidetracked. Aviation officers in the navy will be helpless until such a bureau is formed, giving them identity and authority. The controversy in Congress, instead of scrapping the capital ship, appears to have scrapped naval aviation.

Why American Business Should Aid Starving China

An old friend, a sister republic, a good customer, past, present and prospective, is in dire distress and calling to America for help. China, in her five northern provinces, is facing the worst famine in her history, perhaps the worst disaster in all recorded history. Continuous drought for eighteen months has caused the failure of three successive crops. The next crop will not be harvested until June. For the next four months the population must be fed from outside sources or perish of starvation, and they are freezing as well as starving, for long ago they sold the timbers of their houses, and even most of their clothing, to buy food.

To meet the situation the President has appointed the American Committee for China Famine Funds, with Thomas W. Lamont, of New York, as chairman, and headquarters at the Bible House, Astor Place, New York.

The immediate need, the American Committee reports, is for money, which is cabled over to Peking and there disbursed and accounted for by a local committee of representative American business men and missionaries, including Hon. Charles R. Crane, American minister. The sum of $5, it is estimated, will feed a single Chinese until the next harvest in June. Checks should be sent to Vernon Munroe, treasurer, American Committee for China Famine Fund, Bible House, Astor Place, New York City.

War Department Machine Tools and Vocational Training

During the week ended Feb. 12 machine tools to the value of $3,958.42 were sold by the War Department as surplus property. These tools cost the Government originally $31,321.81. This brings the total sales of surplus machine tools to $14,320,623.11, or 44 per cent of the original cost of these tools.

Due to delays in securing surplus machine tools from the War Department the Federal Board for Vocational Education will have to buy a larger number of tools than otherwise would be the case. The demand for mechanical training from former soldiers is so great that the government is expected to become a much larger purchaser of metal working machinery. Of the 79,000 men who have applied for vocational training it is estimated that fully 35 per cent are taking up work which will necessitate mechanical instruction. The Vocational Education Board has received surplus machine tools from the War Department to the value of $250,000.

Personals

GEORGE J. BLANTON, who for the past four years has been connected with the engineering sales department of the Chain Belt Co., Milwaukee, has been made New York district manager.

S. T. THOMPSON has relinquished the office of purchasing agent of the Duplex Engine Governor Co., Inc., Brooklyn, N. Y., and has taken up the responsibilities of the sales department in the capacity of director of sales. The vacancy left by Mr. Thompson has been filled by C. F. GUTTZEIT, who heretofore has been assistant purchasing agent.

H. A. FISHER left the employ of the Merchant Shipbuilding Corporation of Chester, Pa., where he held the position of master mechanic, to take a position as plant engineer for the Worcester Pressed Steel Co. of Worcester, Mass.

GARLAND DANIEL of Greensboro, N. C., has been named receiver for the Southern Truck and Car Corporation of Greensboro, a concern capitalized at $1,000,000. The receiver will continue operation of the company.

GEORGE LAHUSEN, JR., formerly of the E. L. Essley Machinery Co., Chicago, has taken a position with the Badger-Packard Machinery Co. of Milwaukee, Wis., representing them in the southern Wisconsin territory.

O. W. SANDERSON, formerly assistant engineer of mechanical inventions with the B. F. Goodrich Co., Akron, Ohio, has resigned his position to become secretary and treasurer of the Empire State Engine Corporation, with executive offices in New York City.

J. S. GREEN has severed his connection with the Canadian-Ingersoll-Rand Co. of Sherbrooke, Quebec, and is now with the Fuller-Lehigh Co., Fullerton, Pa., as superintendent of shops.

RICHARD M. PAYNE is now sales engineer for the Eastern Service Co., Boston. He was formerly with the Bethlehem Steel Corporation, Boston.

GEORGE W. COOKE, formerly general superintendent of the Pierce Arrow Motor Car Co., Buffalo, is now employed in the same capacity by James Cunningham Sons & Co., Rochester, N. Y.

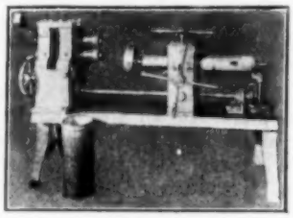
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Embossing Machine, Rotary

Julius Mercy, 2842 N. Maplewood Ave., Chicago, Ill.

"American Machinist," Jan. 27, 1921

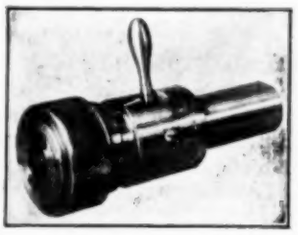


This machine is intended for embossing letters in sheet metal of flat, bent or cylindrical form. It consists primarily of two heads mounted on a heavy cast-iron table. The head at the left carries the embossing rolls. The rolls or dies are made of interchangeable segments, so that any combination of letters or figures can be put in place. The shafts carrying the dies are driven by gears through a positive clutch from a 16-in. pulley back of the headstock. The machine is automatically stopped at the completion of each embossing operation, the rolls at the same time being automatically moved $\frac{3}{4}$ in. apart, so that the work can be removed. The machine can emboss three rows of letters simultaneously in 16-gage sheet steel, 3 hp. being required. It weighs about 2,000 lb.

Die Head, Self-Opening Style "E"

Victor Tool Co., Inc., Waynesboro, Pa.

"American Machinist," Jan. 27, 1921

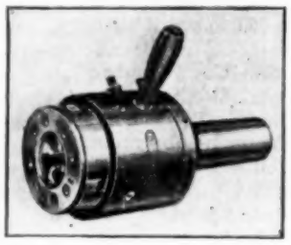


The illustration shows the head, which is intended for stationary use, in the closed position. The same tool adapted to rotary use, as in a drill press, is known as the Style "R" head. The chasers, when in the cutting position, are supported along their entire length back of the cutting edges. The tool can be adjusted for size to enable the cutting of tight or loose threads by turning the large knurled, graduated collar, a range of about $\frac{1}{8}$ in. both under and over size being obtainable. A locking screw holds the collar in place. The standard shanks are hollow, thus permitting the threading of long rods. For cutting close to shoulders, the chasers can be extended through the cap. The head is made in two sizes, one with a capacity from $\frac{1}{4}$ to $\frac{1}{2}$ in. and the other from $\frac{1}{2}$ to $\frac{3}{4}$ in.

Die Heads, Self-Opening, "H & G"

Eastern Machine Screw Corporation, New Haven, Conn.

"American Machinist," Jan. 27, 1921

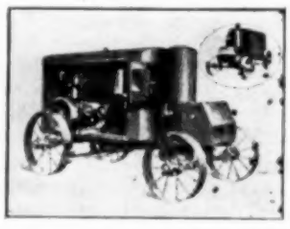


The heads are made in three principal styles. Style "A" is for automatic screw machines, such as the Cone or Gridley. The added sizes in which the head is made are 2½ and 3 in., with capacities of 1¼ to 2½ in. and of 2 to 3 in., respectively. The other sizes range down to ¼ in. Style "C," which is illustrated, is intended for use on machines such as turret lathes, where the die head does not rotate. The added sizes are 2, 2½ and 3 in., having capacities of 1 and 2 in., 1¼ to 2½ in. and 2 to 3 in., respectively, the other sizes being smaller. The third head is intended for use with Brown & Sharpe machines, a ⅞-in. size being added. It is stated that the heads can meet practically all requirements in thread cutting.

Air Compressor, Electric, Portable, "Imperial Type-14"

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

"American Machinist," Jan. 27, 1921



This compressor is similar in general characteristics to the gasoline-driven compressor described on page 736, Vol. 51, of the *American Machinist*. The motor, which can be furnished for either alternating or direct current, is fastened to a sub-base bolted to the cast-steel main frame. The compressor is driven by a belt and has two cylinders cast en-bloc. Plate-type air valves are used for both intake and discharge. Specifications: Capacity, 118 cu.ft. of free air per minute. Pressure, 100 lb. per sq.in. Compressor: two cylinders, 6 x 6 in.; speed, 525 r.p.m. Motor, 25 hp. Receiver: capacity, 8 cu.ft.; size, 1½ ft. diameter x 5 ft. high. Wheels: front, 30 in.; rear, 36 in.; face, 6 in.; tread, 4 ft. 8 in. Weight, about 4,450 lb.

Tapping Machine, Semi-Automatic, Multiple-Spindle

Langelier Manufacturing Co., Arlington, Cranston, R. I.

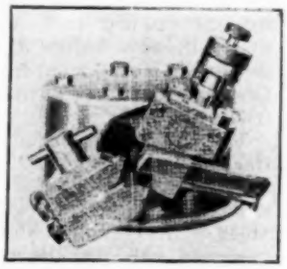
"American Machinist," Jan. 27, 1921

The machine, as illustrated, is fitted for tapping simultaneously nine ¼- and two ⅝-in. holes in a meter case, the production being stated as six cases per minute. It is started by depressing a treadle, the round leather belt from the motor under the table being moved onto the forward driving pulley. The main spindle of the tapping head is thus set in motion through gearing. The work is carried on a table which is raised mechanically, feeding the taps into the work. When the taps have penetrated to the desired depth, the belt is automatically shifted to the reverse pulley, thus reversing the taps and lowering the table at a speed about twice that used for tapping.

Box Tool, "Micro"

Cruban Machine and Steel Corporation, 63 Duane St., New York

"American Machinist," Jan. 27, 1921



This tool is intended for use on screw machines and automatic lathes. It is provided with a 1-in. shank, and can handle bar stock up to 1 in. in diameter. The toolbit can be adjusted to or from the work, a dial being provided so that the movement can be read directly in thousandths of an inch. The micrometer screw can be locked in place. The "V" guides are controlled by spring pressure. They can be held in place by the locking stud, after their proper position has been determined by allowing them to spring against the stock. In order to lock them in position, screws are provided back of the guides. The high-speed steel toolbit is provided with a notch at the end, into which an adjusting nut is placed. The tool is thus prevented from slipping while in use.

Threading Tool, Spring

Ready Tool Co., Bridgeport, Conn.

"American Machinist, Jan. 27, 1921

The tool has a goose-neck so as to allow the cutting of smooth threads and the decreasing of chatter. The cutter is made of high-speed steel and held at an angle of 15 deg. from the vertical. The side angles are so ground as to cut a 60-deg. thread. Only the top surface of the cutter is ground when sharpening the tool. The cutter is secured on the left side of the holder by means of a dovetailed joint, so that threads can be cut close to a shoulder. There are teeth on the back of the cutter and in the front of the dog holding it in place. The dog is clamped to the holder, so that the cutter is prevented from slipping. V-shaped cutters, as well as U. S. Standard chasers, are carried in stock. The tool is made with right-hand offset, and is ½ x 1 x 7 in. in size.

Grinding Machine, Piston-Ring, Automatic

Persons-Arter Machine Co., 72 Commercial St., Worcester, Mass.

"American Machinist," Jan. 27, 1921

This is primarily an attachment which can be placed on the company's standard rotary-table grinding machine. The illustration shows the attachment in place on a machine constructed especially for this purpose, single-speed chain drive to the work table being used instead of the usual belt on three-step cone pulleys. The attachment feeds piston rings on and off the work table automatically, is operated by compressed air taken from the air lines of the shop, is a complete unit in itself, and depends upon the machine of which it thus becomes a part only for the timing of its movements. The air cylinder is underneath the work table, a balanced D-valve being used, and the piston rod being provided with rack teeth which engage the gear to be seen on the vertical shaft.

Clip, paste on 3 x 5-in. cards and file as desired

S. M. HERSHEY has been appointed sales engineer of the Precision Grinding Wheel Co., of Holmesburg, Pa., a suburb of Philadelphia. Mr. Hershey was formerly district sales manager at Philadelphia for the Heald Machine Co., of Worcester, Mass.

WALTER H. BAKER, former president of the Charleroi, Pa., alloy steel plant acquired by the Electric Alloy Steel Co., was named a member of the board of directors of the latter company at its recent annual meeting.

L. A. LENHART, until recently with the General American Tank Car Corporation in Chicago, was named vice-president and general manager at the organization of the board of directors of the Youngstown Steel Car Co., Youngstown, O., held recently.

Business Items

Steel products and automobile rims will be manufactured by the Caddenhead Auto Rim Co., which has begun construction on the second unit of its plant and shops at Tarrant City, Ala., near Birmingham.

JOHN MOHR & SONS announces that it has consolidated its Chicago and South Chicago works. Its general offices are now located at 96th and Calumet River, South Chicago, Ill.

The American Emery Wheel Works, Providence, R. I., has increased its capital stock from $100,000 to $1,000,000.

A change has been made in the official force of the Newton Steel Co., Newton Falls, Ohio. H. M. Steel who has been located here having direct charge of operations in the plant has moved to the general offices of the company in Youngstown. He will continue as vice-president and general manager of the company: F. P. McGlyar has been named superintendent of operations at Newton Falls.

At the annual meeting of stockholders of the Union Metal Co., Canton, Ohio, held here this week, C. C. Barrick was elected president and general manager; D. C. Barrick, secretary; C. L. Eshleman, vice-president; L. M. Barrick, treasurer.

A certificate of partnership under the name of American Foundry has been filed by Nicholas A. Buotich and Bare Skarpa, both of San Diego, Cal.

On Feb. 19, the main office of the Becker Milling Machine Co., the Reed-Prentice Co. and the Whitcomb-Blaisdell Machine Tool Co. was closed and the new main office is now located at 677 Cambridge St., Worcester, Mass., which is the Prentice Department of the Reed-Prentice company.

A manufacturing plant which will include machine shops, foundry, etc., will probably be established in Atlanta as the result of the organization and incorporation in that city recently of the National Bean and Pea Picker Company with a capitalization of $250,000. The company will manufacture a bean and pea picking machine recently invented.

Amalgamated metal products will be manufactured in the new plant of the Cole Engineering Corporation at Chattanooga, Tenn., officials stating that the building has been almost completed and operations are expected to start in the near future. About $60,000 was invested in the construction of the plant. The company also operates a plant in Pennsylvania.

The Perfection Patents, Inc., has been organized at Syracuse, N. Y., to make fire extinguishers. The capital of the concern is $50,000.

The Kilby Frog and Switch Co., Birmingham, Ala., has increased its capital stock to $300,000.

New Publications

Factory Organization and Administration. By Hugo Diemer, formerly Professor of Industrial Engineering, Pennsylvania State College. Three hundred and ninety-eight 6½ x 9-in. pages, illustrated with diagrams and forms. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

The third edition of Mr. Diemer's well-known book has been revised and slightly enlarged to bring it up to date with modern procedure. The principal changes occur in the chapters relating to general organization, employment and industrial relations, and functional control of production.

While intended as a reference book for the actual practitioner in manufacturing work it has had, in previous editions, a wide use as a textbook for college and technical students.

The closing chapter contains a complete bibliography of works management. It is divided into the following subdivisions: Reading and study necessary for the man who aspires to success in business administration and industrial management; a business or shop library for managers and employees; a bibliography of the classical or pioneer literature of works management or industrial engineering prior to 1904; a standard reference library of industrial management and industial engineering; a comprehensive library of supplementary reading for a school of engineering or school of business administration or public library.

Trade Associations. By E. H. Naylor. Published by The Ronald Press Co., 20 Vesey St., New York City.

There are over 1,000 trade associations in the United States. E. H. Naylor, an experienced executive of such organizations, has written a practical helpful book that ought to be interesting to both volunteer and professional workers in this field of economic activity. His chapter on statistics might well have carried some suggestions as to successful methods of using the statistics that are gathered. Perhaps some day some one will study the various activities now or heretofore carried on by trade associations, and compile a classified list of these activities with an index to the associations that have tried out each particular activity. Such a list would enable the busy executive to locate reliable sources of information that might save much effort in starting activities that for one reason or another do not go as well as hoped for.

There is a real reservoir of valuable knowledge to be tapped by some recording of experience along these lines. Such a source of information does not probably already exist or a note of it would no doubt have been made in Mr. Naylor's book.

The author deserves the thanks of many co-workers in the trade association field and his book deserves a place in the library of every business man interested in association work, as an officer or member of such a body. It is the first book printed dealing with the subject in a comprehensive way and should be followed by others.

Trade Catalogs

Cost Cutting Tools. McCrosky Tool Corporation, Meadville, Pa. Catalog No. 8, 6 x 9 in., sixty-four pages. Among the information which this book contains is how to solve reamer trouble; how to revolutionize drill press work; how to increase lathe output; and how to save time and increase the quality of production. The book is replete with illustrations of reamers, chucks and collets, turret attachments for lathes, milling machines, and "Searchlight" lamp brackets.

Bushings. Reliance Machine and Specialty Co., 101-103 Green St., Jamaica Plains, Boston, Mass. This is a small circular giving details of its "Reliance" bushings.

Precision Bench Lathe and Compound Slide Rest. Stark Tool Co., Waltham, Mass. Circular, pp. 4, 8½ x 11 in. This circular describes and illustrates its precision bench lathe and its improved compound slide rest. It gives full specifications of each.

Reamers. Gisholt Machine Co., Madison, Wis. This is a three-page circular giving a brief description of its manufacturing reamer. Its principal dimensions and sizes are given.

C-H Brakes. Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Catalog No. 850, 8½ x 11 in., pp. 80. This catalog describes and illustrates shoe brakes for both direct- and alternating-current service. Tables of dimensions and ratings are included.

Proof Book. Edward R. Ladew Co., Inc. 428 Broadway, New York. Catalog, pp. 31, 5½ x 7¾ in. This booklet is a compilation of evidence of the dependability of Hoyt leather belting in service, with a brief discussion of some of the fundamentals of belting.

Stewart Furnaces. Chicago Flexible Shaft Co., 5600 Roosevelt Rd., Chicago, Ill. This folder describes and illustrates some of the standard types and sizes of its Stewart furnaces, and gives a list of some of the work done by them.

Factories That Fit. Frank D. Chase, Inc., 645 North Michigan Ave., Chicago, Ill. Booklet, 8 x 5½ in. This company has recently compiled an illustrated booklet on "Factories That Fit" and gives its conception of the importance of sound engineering design in factory construction.

Forthcoming Meetings

The National Metal Trades Association will hold its annual convention at the Hotel Astor, New York, on April 18, 19, 20, 21. Homer D. Sayre, Peoples Gas Building, Chicago, Ill., is secretary.

The Engineering Section of the National Safety Council will hold its annual meeting in Philadelphia on Feb. 28. This meeting will be held jointly with the Philadelphia section of the A. S. M. E.

The annual meeting of the American Welding Society will be held in the Engineering Societies Building, 29 West 39th St., New York, on April 22.

The Society of Industrial Engineers will hold its national convention in Milwaukee, Wis., on April 27, 28 and 29. Geo. C. Dent, 327 So. La Salle St., is business manager.

The National Foreign Trade Council will hold its eighth annual convention in Cleveland, Ohio, on May 4, 5, 6 and 7. J. G. Hammond, care of the Council, 409 Park Bldg., Cleveland, is secretary.

A triple convention of the National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association will be held in Atlantic City, N. J., May 16, 17 and 18, 1921, with headquarters for all three associations at the Marlborough-Blenheim. F. D. Mitchell, 4106 Woolworth Building, New York, is secretary of the last-named association.

The American Society of Mechanical Engineers, 29 W. 39th St., New York, will hold its spring meeting in Chicago, May 23 to 26 inclusive, at the Congress Hotel.

The Society of Automotive Engineers, 29 West 39th St., New York announces that its summer meeting will be held at West Baden, Ind., on May 24 to 28 inclusive.

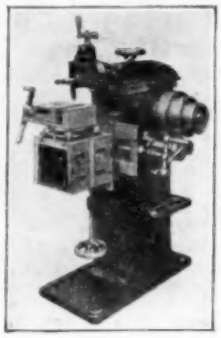
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Shaper, 8½-In.

Brown & Ward, Ltd., Birmingham, England

"American Machinist" (European Edition), Sept. 18, 1920

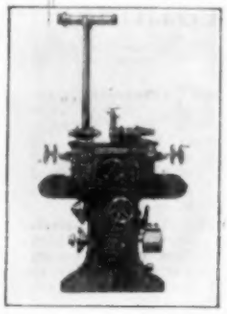


This machine is said to be plain and well built. It has a long crank, which swings from the bottom of the base. The table is T-slotted and carries a swiveling vise, the jaws of which are made of hardened steel, are 6 in. wide and open 5 in. The horizontal travel of the table is 12 in. and the vertical movement 7½ in. The table is 9 x 9 x 7¾ in. The crossfeed is automatic. The toolhead has a vertical movement of 2 in., having a micrometer adjustment. Shafts up to 1½ in. in diameter can be keywayed under the ram, an adjustable screw support being available at the back for lining up the shafts. The floor space is 2 ft. 8 in. x 3 ft. 2 in.; weight, about 920 lb.

Grinding Machine, Precision, Instrument

Harry F. Atkins, Ltd., Qld Fletton, Peterborough, England

"American Machinist" (European Edition), Sept. 18, 1920



This is a rigid, self-contained universal grinding machine adapted to small, fine work. It has ball bearings throughout, excepting in the bearings of the heads. The traverse mechanism is stated to be smooth in action, and the reverse positive and fully under control. It is said that the abrasive wheel can be made to work between two shoulders, grinding the diameter and the shoulders at the same time with the power traverse in action. The traverse of the table is obtained from a heart cam, the stroke being varied by altering the position of the fulcrum of an oscillating lever. The drive is obtained from a small drum countershaft overhead, attached to the machine. The tank from which the centrifugal pump draws its supply is formed in the base. The capacity of the machine is 5 in. diameter by 6 in. long.

Microscope for Brinell Depressions, Etc., "Talyden"

Taylor, Taylor & Hobson, Ltd., Leicester, England

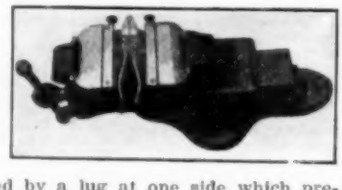
"American Machinist" (European Edition), Oct. 2, 1920

This device measures the diameters of depressions made when testing metals, etc., by the Brinell method. A graticule is incorporated, enabling diameters up to 7 mm. (0.275 in.) to be measured. The microscope objective forms an image of the object viewed twice the size in the plane of the graticule, and both image and graticule are in turn magnified and viewed by the eye-piece at the top, the total magnification being 16 diameters. It is stated that the field is flat, well corrected and free from distortion and objectional color fringes, and that the instrument is guaranteed in accuracy to within 0.02 mm. (about 0.001 in.). It stands about 7 in. high and weighs 1½ lb.

Vise, Attachment, Universal, "Allan & Magowan"

Alfred Herbert, Ltd., Coventry, England

"American Machinist" (European Edition), Nov. 6, 1920

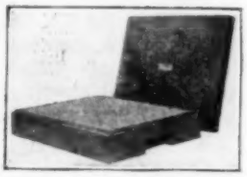


The purpose of this attachment is to enable material of practically any form to be held in a standard vise. The attachment is made in three sizes: 4, 5 and 6 in. wide. The cut shows the smallest, an extra jaw being added for the 5-in. size and two jaws for the 6-in. size. Two such attachments form a set. One is slipped over each vise jaw, being positioned by a lug at one side which prevents end movement in one direction. The grips are of tool steel; they can be furnished in any desired form on the working face and serrated either vertically or horizontally.

Surface Plates, Glass

A. Leonard & Co., Croydon, England

"American Machinist" (European Edition), Sept. 18, 1920

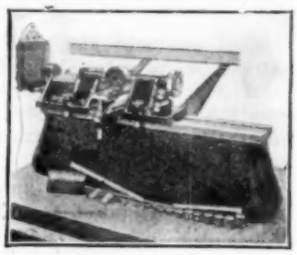


These plates are said to be guaranteed to within one-quarter of a ten-thousandth of an inch, i.e., 0.000025 in. They are made from plate glass, ¾ to 1¼ in. thick, according to the size. They show from 100 to 120 hardness on the scleroscope. Should at any time the surface of a plate become slightly hollow the surface can be reground. The plates are made in the following sizes: 6 x 4½ in., 8½ x 6½ in., 14 x 11 in. and 24 x 19 in. Their main use is for toolroom work. The base of the plate is ground dead true to the top surface, enabling the plate to be placed on the bed of a machine or elsewhere for lining-up purposes.

Measuring Machine, Comparator, Optical, 12-In.

A. Leonard & Co., Ltd., Croydon, England.

"American Machinist" (European Edition), Oct. 2, 1920

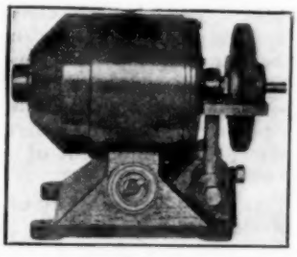


The machine is intended to register accurately length measurements up to 12 in. within a limit of 0.0005 in. It has a heavy-section box bed, on the machined top surface of which are mounted two headstocks, one fixed and one adjustable. Each headstock carries an anvil, the measurement being made between the anvils. The fixed headstock carries a light box and the optical element, also the amplifying mechanism. The amplifying mechanism is so designed that any slight movement of the main body adjusts the ratio between the two sides of the first lever, maintaining the ratio of 7 to 1. The smallest lever is the most important feature of the whole unit, as any slight error on this causes considerable alteration to the scale. A total magnification of 1,000 can be obtained.

Grinder, Electric, Bench

Wilson-Wolf Engineering Co., Ltd., Bradford, England

"American Machinist" (European Edition), Oct. 30, 1920



This grinder has been redesigned. The motor is compound wound and dustproof, and has ½ hp. at 3,200 r.p.m. It is said to be able to stand a heavy overload and rough treatment. The wheel is 6 in. in diameter by ½ in. wide. A universal work rest is fitted. The grinders have rubber pads under the bases and therefore need not be bolted down. They are said to run quietly. The grinders are stocked wound for 100 to 110 volts and for 200 to 250 volts, but motors for other voltages can be supplied.

Cutter, Face-Milling, Inserted-Tooth

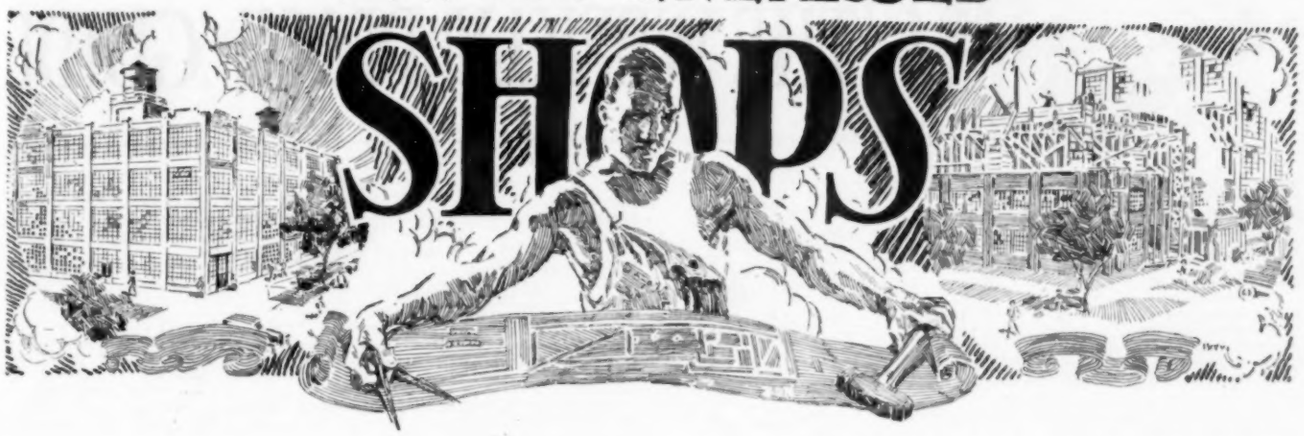
Alfred Herbert, Ltd., Coventry, England

"American Machinist" (European Edition), Nov. 6, 1920

This cutter consists of high-speed steel inserted teeth of round section secured in a steel body. It is claimed that, though the teeth are held so that they will not move under the heaviest cuts, they can be removed quickly. The holes in which the cutters are secured are inclined to the axis of the cutter body, so as to provide rake on the periphery and end cutting edges, and the shank of each individual cutter is milled flat with serrations across it. Cutters of this type can be furnished to suit any milling machine.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

Mass., Lowell—The W. W. Carey Co., Inc., Bway.—one complete oxyacetylene welding outfit, (give lowest price and list of parts).

Pa., Philadelphia—A. Leahan, c/o Bahls, 19th and Market Sts., metal manufacturer—circular rig saw.

Pa. Philadelphia — H. L. Rieder, 347 North 4th St., manufacturer of showcases—double spindle shaper.

Fla., Orlando—The Motor Parts Service Co., C. Williams, Pres.—lathe, 8 in. swing, 24 in. between centers.

Va., Richmond — The Auto Radiator Fender and Repair Shop, 1031 West Broad St.—electric hand drill press with bench attachment.

Va., Richmond — Broske & Ehmig, 1504 West Broad St., auto repairers—
One light lathe.
One gasoline street pump.
One cylinder grinding outfit.

Va., Richmond — The Chesterfield Auto Repair Shop 724 West Broad St.—cylinder grinder and gear press.

Va. Richmond—J. C. Elliotts' Garage, 1502 West Broad St., auto repair shop—
One drill press.
One portable electric drill.
One light lathe.

Ill., Chicago—The Union Bed Spring Co., 1100 Blackhawk St.—punch press with 2½ in. to 3 in. stroke.

Mich., Detroit — The Lincoln Tool Co., 864 Hubbard Ave.,—miscellaneous machine shop equipment.

O., Dayton — The F. H. Bickford Co., Commercial Bldg., manufacturers of machine tools and small parts, F. H. Bickford, Pres.—several Brown & Sharp automatic screw machines.

Wis., Milwaukee—F. Goethel, 491 12th St.—Sheet iron roller and shear, 3 ft. wide or more, for sheet metal works.

Wis., Waterford—O. R. Graf—garage repair machinery.

Wis., Waupun—The Safety Fender Co., A. H. Luebke, Purch. Agt.—machine tools and sheet metal machinery for the manufacture of automobile fenders.

N. D., Jamestown—J. Arneson, machinist and engr.—machinery for rebuilding tractors and steam engines, reboring all kinds of cylinders, manufacturing tanks, stacks, etc.

Que., Montreal—I. W. David, 134 Bloomfield St. — equipment for garage on St. Dominique St.

Machinery Wanted

Conn., Hartford—The Newington Metal Goods Co., 284 Asylum St.—single action power press, to correspond with a No. 4 or 5 Farrel foundry power press (used).

Mass., West Springfield—(Springfield P. O.) J. Rose, 87 Norman St.—portable saw mill outfit.

N. Y., Utica—The Utica Gas & Electric Co., 222 Genesee St., one 75 ton electric traveling crane.

Tenn., Memphis—D. D. Woollard, Chamber of Commerce, complete equipment and machinery for cotton picking, etc.

S. C., Denmark—Chamber of Commerce, R. A. Easterling, Pres.—complete equipment for pulp mill.

Va., Richmond—J. A. Umlauf, 1326 West Broad St., upholsterer—
One swing saw.
One cylinder for Champion hair picker.
One double set hackles.

Ill., Rockford — The Water Dept., T. Conners, Supt.—one traveling crane.

O., Columbus — The Western Fuel Co., Outlook Bldg., A. Breuholtz, Pres.—shaker screens and picking tables for Mine 10 at Orbiston.

Wis., Cedarburg — F. Wetzel, manufacturer of special furniture—one trimming saw, power operated.

Wis., Milwaukee — The Morning Dew Products Co., 986 Oakland Ave., L. F. Bond, Purch. Agt.—special machinery for the manufacture of oleo and dairy products, also tanks for its branch at Ironwood, Mich.

Wis., Milwaukee — The Wisconsin Ice & Coal Co., 216 West Water St.—ice making machinery.

Wis., New London — The Wisconsin Cabinet & Panel Co., F. L. Zang, Genl. Mgr.—equipment and new surfacing machines.

Wis., Oconomowoc — The Oconomowoc Canning & Product Co.—new machinery.

Tex., Galveston—The Julo Bottling Co., Galveston, subsidiary Southern Beverage Co., 200 West Camden St., Baltimore, Md.—bottle washers and bottling machinery for its plant at Baltimore.

Ont., Amherstburg—The Conklin Planing Mills—machinery.

Ont., Guelph—The Sterling Rubber Co.—special equipment for the manufacture of rubber products.

Metal Working

NEW ENGLAND STATES

Conn., Hartford — The Hartford-Buick Co., 51 Elm St., has awarded the contract for the construction of a garage, sales and service building, containing 30,000 sq.ft. floor space, on Connecticut Blvd. Estimated cost, $125,000. Private plans.

Conn., New Britain—Horwitz & Rotstein, 184 Arch St., have awarded the contract for the construction of a 1 story garage on Arch St. Estimated cost, $10,000.

Mass., Boston—The Boston Elevated R.R., Massachusetts Ave., has had plans prepared for the construction of a 3 story, 55 x 500 ft. repair shop at Forest Hills. Estimated cost, $500,000. M. Fernald, c/o owner, Engr.

Mass., Boston—The Boylston Garage Co., Boylston St., is having plans prepared for the construction of a 6 story, 48 x 134 ft. garage. Estimated cost, $500,000. J. C. Spoffard, 36 Bromfield St., Archt.

Mass., Springfield — Chaplin & Chaplin, 374 Main St., will build a 1 story, 50 x 180 ft. garage, etc., on Pecousic Ave. Estimated cost, $40,000. A. W. Cobb, 374 Main St., Archt. Noted Feb. 3.

Mass., Springfield—The Chapman Valve Mfg. Co., Pine St., is having plans prepared for the construction of a 1 story, 50 x 275 ft. foundry with two 20 x 275 ft. wing additions. Associated Architectural & Engrg. Co., 145 State St., Archts.

Mass., Whitinsville—The Whitin Machine Wks. is having plans prepared for the construction of a 3 story garage and storage warehouse. Estimated cost, $150,000. J. D. Leland, 41 Mt. Vernon St., Boston, Archt.

Mass., Worcester—The R. P. Power Fdry. Co., Albany St., will soon award the contract for the construction of a 1 story foundry. Estimated cost, $40,000. Private plans. Noted Feb. 3.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Durabilt Fly-Screen & Mfg. Co., 1326 North Spring St., recently incorporated with $50,000 capital stock, is having plans prepared for the construction of a 1 story, 57 x 67 ft. plant. G. H. Frankton, Pres.

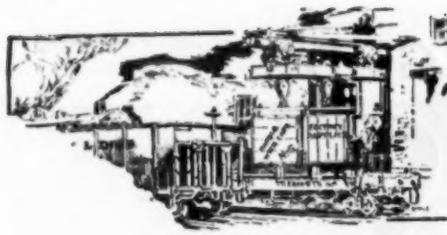
N. Y., New York—(Borough of Bronx) S. Garry, 523 West 187th St., has had preliminary plans prepared for the construction of a 1 story, 123 x 140 ft. garage on Jerome Ave. Estimated cost, $50,000. Dunningan & Crumley, 394 East 150th St., Archts.

N. Y., New York—(Borough of Bronx) The Shakin Realty Co., 220 Bway. has had plans prepared for the construction of a 1 story, 75 x 225 ft. garage on Inwood Ave. Estimated cost, $60,000. Dunningham & Crumley, 394 East 150th St., Archts.

N. Y., New York—(Borough of Bronx) S. B. Steinmetz, 449 East 150th St., will build 1 story, 100 x 100 ft. garage on Southern Blvd. and 172d St. Estimated cost, $35,000.

N. Y., New York — (Borough of Manhattan) The S. P. Bldg. Co., 3011 Barnes Ave., is building a 1 story, 99 x 100 ft. service station on 162d St. Estimated cost, $30,000.

N. Y., New York — (Borough of Manhattan) The White Fuel Oil Eng. Co., 742 East 12th St., will soon award the contract for the construction of a 2 story, 99 x 103 ft. foundry at 732-8 East 12th St. Private plans.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$31 52	$44.60
Northern Basic	29 52	42.80
Southern Ohio No. 2	33.25	43.80
NEW YORK—Tidewater Delivery		
2X Virginia (Silicon 2.25 to 2.75)	33.77	47.65
Southern No. 2 (Silicon 2.25 to 2.75)	36.16	47.70
BIRMINGHAM		
No. 2 Foundry	28.00	41.00
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25–2.75 sil.	30.09*	45.35*
Virginia No. 2	35.74*	43.25*
Basic	31.40†	43.00†
Grey Forge	31.26*	42.50*
CHICAGO		
No. 2 Foundry local	29.00	43.25
No. 2 Foundry, Southern	34.17	46.60
PITTSBURGH, including freight charge from Valley		
No. 2 Foundry	28.00	43.65
Basic	25.00	42.90
Bessemer	27.00	43.40

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	*Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.58	$3.58	$3.97	$3.58	$5.50	$3.58	$3.97
Soft steel bars	3.48	3.45	4.12	3.34	5.00	3.48	3.87
Soft steel bar shapes	3.48	3.45	4.12	3.48	....	3.48	3.87
Soft steel bands	4.18	4.18	4.82	6.25	6.25	....	....
Ta k pla es	3.78	3.78	4.17	3.78	5.00	3.78	4.17

*Add 10c for trucking charge to Jersey City and 15c. to New York and Brooklyn from warehouse.

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$2.25 $2.35	$4.25
Warehouse, New York	3.23	4.57
Warehouse, Cleveland	3.52	3.42
Warehouse, Chicago	4.12	3.52

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York *Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55	4.68	6.80	4.50	4.68
No. 12	3.60	4.73	6.85	4.60	4.73
No. 14	3.65	4.78	6.90	4.65	4.78
No. 16	3.75	4.88	7.00	4.75	4.88
Black					
Nos. 18 and 20	4.20	5.58	7.30	5.30	5.55
Nos. 22 and 24	4.25	5.63	7.35	5.45	5.60
No. 26	4.30	5.68	7.90	5.50	5.65
No. 28	4.35	5.78	8.00	5.60	5.75
Galvanized					
No. 10	4.70	6.13	9.00	5.95	6.10
No. 12	4.80	6.23	9.10	6.05	6.20
No. 14	4.80	6.23	9.10	6.05	6.20
Nos. 18 and 20	5.10	6.63	9.40	6.35	6.50
Nos. 22 and 24	5.25	6.78	9.55	6.50	6.65
No. 26	5.40	6.93	9.70	6.65	6.80
No. 28	5.70	7.13	10.00	7.95	7.10

*To these prices 10c must be added for delivery in Jersey City and 15c. for New York and Brooklyn.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.25	$4.84
Flats, square and hexagons, per 100 lb. base	6.00	5.75	5.34

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL—Base prices in cents per pound any quantities, f.o.b. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Co'd rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55

Special Nickel and Alloys	
Malleable nickel ingots	40
Malleable nickel sheet bars	42
Hot rolled rods, Grades "A" and "C" (base)	65
Cold drawn rods, grades "A" and "C" (base)	77
Copper nickel ingots	42
Hot rolled copper nickel rods (base)	52
Manganese nickel hot rolled (base) rods, "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f.o.b. New York: 3/32, 8½c. per lb.; ⅛, 8c.; 5/32 to ¼, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.50	8.00	9.00
Spring steel (light)	10.00	7.00	12.00
Coppered bessemer rods	9.00	8.00	7.00
Hoop steel	4.58	4.04	4.18
Cold-rolled strip steel	9.00	8.25	9.25
Floor plates	5.75	4.00	6.03

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛ to 3	57½%	44%	⅛	15½–16½%	+10½–11½%
			¼	19½–20½%	1½– 2½%
			⅜ to 1¼	24½–25½%	8½– 9½%

LAP WELD

2	50½%	38%	2	20½–21%	6½– 7%
2½ to 6	53½%	41%	2½ to 6	22½–23%	9½–10%
7 to 12	50½%	37%	7 to 12	19½–20%	6½– 7%
13 to 14	41%	....			
15	38½%	....			

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛ to 1¼	55½%	43%	⅛ to 1¼	24½–25½%	9½–10½%
2 to 3	56½%	44%			

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	48½%	37%	2	21½–22½%	8½– 9%
2½ to 4	51½%	40%	2½ to 4	23½–24%	11½–12%
4½ to 6	50½%	39%	4½ to 6	22½–23%	10½–11%
7 to 8	46½%	33%	7 to 8	14½–15%	2½– 3%
9 to 12	41½%	28%	9 to 12	9½–10%	+2 –2½%

Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅛ to 3 in. steel butt welded	44%	28%	42½%	33½%	57½%	44%
2½ to 6 in. steel lap welded	39%	24%	44½%	29½%	53½%	41%

Malleable fittings, Classes B and C, banded, from New York stock sell at plus 6%. Cast iron, standard sizes, 15% off.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	13.75	15.00	18.50
Tin in 5-ton lots	33.00	34.25	61.50
Lead	4.62½	5.75	9.00
Zinc	6.00	7.00	8.85
ST. LOUIS (In carload lots)			
Lead	4.22½	5.25	8.87½
Zinc	5.60	6.00	8.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

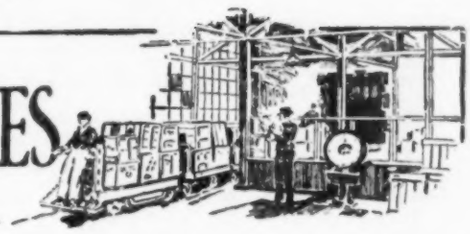
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	21.00	22.50	29.50	23.00	31.00	24.25	36.00
Copper wire (carload lots)	16.00	17.00	29.25	19.00	29.50	24.00	27.00
Brass sheets	18.75	20.25	26.50	24.00	29.00	26.50	27.00
Brass pipe	23.50	25.00	32.00	25.00	34.00	21.50	35.00
Solder (half and half) (case lots)	22.50	27.75	39.00	26.00	40.50	21.00	38.00

Copper sheets quoted above hot rolled 24 oz., cold rolled 14 oz. and heavier add 2c.; polished takes 5c. per sq. ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 1,000 lb. and over, warehouse; net extra:

	Current	One Year Ago
New York	16.75	23.75
Cleveland	20.00	27.00
Chicago	21.25	26.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 11.50

	Warehouse			
	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	13.70	15.00	14.30	15.50
New York	12.50	14.00	13.50	14.50
Chicago	14.50	15.00	14.95	15.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	6.00	10.87½
Chicago	6.50	11.50
Cleveland	7.50	13.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	11.50	17.00	10.00	10.50
Copper, heavy, and wire	11.00	16.25	9.50	9.00
Copper, light, and bottoms	9.00	15.00	9.00	8.00
Lead, heavy	4.00	7.25	4.00	3.75
Lead, tea	3.00	6.00	3.00	3.00
Brass, heavy	7.00	10.00	7.00	10.00
Brass, light	5.50	9.00	5.00	5.50
No. 1 yellow brass turnings	6.00	9.00	5.50	6.00
Zinc	4.00	5.25	3.00	3.50

ALUMINUM—The following prices are spot from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	28.2@28.1	24.50	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	23.50	33.00
Chicago	24.50	29.00
Cleveland	22.00	32.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	70.00	90.00	46.00	71.00	35.00	70.60
Commercial	30.00	50.00	16.50	21.50	9.00	15.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York, we quote the best two grades, although lower grades may be obtained at much lower prices.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	List	+$3.00	$1.00	$1.00	+ 1.15	1.25
Hot pressed hexagon	List	+ 3.00	1.00	1.00	+ 1.15	1.25
Cold punched hexagon	List	+ 3.00	1.00	1.00	+ 1.15	90
Cold punched square	List	+ 3.00	1.00	1.00	+ 1.15	90

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	60%	40%
Chicago	70%	50%
Cleveland	70%	55%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
All sizes up to 1 by 30 in	45%	60%	50%
1¼ and 1½ in. by 3 in. up to 12 in	25%	50%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York....$4.50 Cleveland....$3.50 Chicago....$2.50

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York....$6.00 Cleveland....$4.00 Chicago....$4.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+40%	50%	40%
Larger and longer up to 1 in. by 30 in.	+40%	40%	40%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	35%	20%	10%	30%
Chicago	net	10%	net	10%
New York	50%	10%	25%	10%

RIVETS—The following discounts are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅛ and smaller	45%	50%	45%
Tinned	45%	50%	30%

Structural, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.20 Cleveland...$5.00 Chicago....$5.08 Pittsburgh...$3.90

Boiler, same sizes:

New York...$5.30 Cleveland...$5.10 Chicago....$5.18 Pittsburgh...$4.00

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	24.50	27.00	29.00
Brass	23.50	24.00	28.00

Prices vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities less than 25 lb. add 10c. per lb.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $.75.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $7.50 per 100 lb.

In Cleveland—$8.50 per 100 lb.; New York price is 8@8½c.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	7.50@13.00	13.00	13.00	14.25
Colored mixed	7.00@11.00	9.00–12.00	10.00	12.00

WIPING CLOTHS—Jobbers' price per 1,000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.00	$2.25
Philadelphia	2.00	2.75	2.00
Cleveland	3.25	4.00	2.50
Chicago	2.50	2.25	2.25

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.70	$3.50	$3.40
Philadelphia	3.65	3.65	4.25
Chicago	4.50	4.00	5.00

COKE—The following are prices per net ton at ovens, Connellsville:

	Current	One Month Ago	One Year Ago
Prompt furnace	$4.50	$5.00@$5.50	$6.00
Prompt foundry	5.50@6.50	6.25@7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	0.85

LINSEED OIL—These prices are per gallon:

	New York		Cleveland	Chicago	
	Current	One Year Ago	Current	Current	One Year Ago
Raw in barrels, (5 bbl. lots)	$0.73	$1.87	$0.90	$0.75	$1.66
5-gal. cans	0.76	....	1.15	0.90	1.86
1-gal. cans (2 to case)	0.76	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	13.00	14.50	15.00	17.00	13.00	15.50
25 and 50-lb. kegs	13.25	14.75	15.25	17.25	13.25	15.75
12½-lb. keg	13.50	15.00	15.50	17.50	13.50	16.00
5-lb. cans	16.00	17.50	17.00	20.00	16.00	18.50
1-lb. cans	18.00	19.50	18.00	22.00	18.00	20.50

500 lb. lots less 10% discount. 2,000 lb. lots less 10-4% discount. 10,000 lb. lots less 10-7½% discount.

Pa., Bolivar — The Miller Garage Co. will soon award the contract for the construction of a 2 story, 50 x 100 ft. garage. Estimated cost, $50,000. W. R. Myton, 1st Natl. Bank, Johnstown, Archt.

SOUTHERN STATES

Fla., Tampa — The Burger Repair & Constr. Co. plans to build a plant for the manufacture of portable band saws.

W. Va., Logan—J. W. Fisher plans to build a 40 x 86 ft. garage.

MIDDLE WEST STATES

Ill., Chicago—M. Fesel, 2136 Wilson Ave., will soon award the contract for the construction of a 1 and 2 story, 100 x 110 ft. addition to his garage on Western and Montrose Aves. Estimated cost, $60,000. J. K. Neebe, 2522 Aubert Ave., Archt.

Ill., Chicago—The Hannifin Mfg. Co., 621 South Kolmar Ave., manufacturer of special machinery, has had plans prepared for the construction of a 2 story, 90 x 160 ft. factory on Knox and Wellington Aves. Estimated cost, $200,000. M. J. Hannifin, Pres.

Ill., Chicago — O. Johnson, 7722 Paxter St., will soon award the contract for the construction of a 1 story, 72 x 165 ft. garage on South Stony Island Ave. near 69th St. Estimated cost, $30,000. A. G. Lund, 449 West 63d St., Archt.

Ill., Chicago — The Sampson Mfg. Co., 4244 West Lake St., manufacturers of gas and electric fixtures, has awarded the contract for the construction of a 1 story, 40 x 125 ft. factory at 3244 West Lake St., to replace the one which was recently destroyed by fire. Estimated cost, $12,000.

Ill., Chicago—G. F. Weiland, 6153 Kimbark Ave., will soon award the contract for the construction of a 1 story, 98 x 130 ft. service station at 6850-8 Parnell Ave. Estimated cost, $50,000. W. S. Armstrong, 127 North Dearborn St., Archt.

Ill., Chicago—Zimmerman, Saxe & Zimmerman, Archts., 64 East Van Buren St., will open bids about March 10 for the construction of a 2 story addition to factory at 1755 Northwestern Ave., for the Runzel Lenz Electric Mfg. Co., 1751 Northwestern Ave.

O., Cleveland—The Lindsay Wire Weaving Co. plans to build a 2 story, 100 x 200 ft. factory at 14025 Aspinwall Ave. Estimated cost, $75,000. H. L. Lindsay, Pres. Private plans.

O., Columbus — The Jeffrey Mfg. Co., North 4th St., manufacturers of elevating, conveying and mining machinery, is having sketches made for the construction of a 1 story, 125 x 350 ft. factory. Estimated cost, $250,000.

O., East Cleveland — (Cleveland P. O.) C. Mornono Garage, 12432 Superior Ave., Cleveland, will receive bids until March 10 for the construction of a 2 story, 52 x 120 ft. garage on Superior and Bender Aves. Estimated cost, $60,000. Whitworth & Johnson, 413 Engineers Bldg., Cleveland, Archts.

Wis., Manitowoc—The Hamacheck Bleser Co., Flat Iron Bldg., plans to build a 3 and 4 story, 80 x 100 ft. garage on South Water St. Estimated cost, $80,000.

Wis., Oconomowoc — The Oconomowoc Canning & Product Co. plans to build a 3 and 4 story, 70 x 125 ft. addition to its factory on Main St. Estimated cost, $100,000. P. Binzel, Pres.

Wis., Waupun—The Safety Fender Co., c/o A. H. Luebke, plans to build a 2 story, 60 x 185 ft. factory on Main St., for the manufacture of automobile safety fenders. Estimated cost, $50,000.

Wis., Wausau—The Marathon Electric Mfg. Co., Plumer Island, plans to build a 2 story, 50 x 150 ft. addition to its factory. Estimated cost, $75,000.

WEST OF MISSISSIPPI

Mo., Kansas City—D. L. Piggot, 12th and Prospect Aves., plans to build a 1 story, 113 x 144 ft. garage. W. E. Harris, 2110 North 5th St., Kansas City, Kan., Associated Archt.

Mo., Kansas City—The Sunshine Safety Lamp Co., 1005 McGee St., has awarded the contract for the construction of a 2 story, 50 x 115 ft. factory.

Tex. Weatherford — O. Jones plans to build a showroom and service repair shop.

CANADA

Ont., Ottawa—The Beach Fdry. Co., Hinton Ave., will build a 240 x 360 ft. iron foundry. Estimated cost, $35,000.

General Manufacturing

NEW ENGLAND STATES

Mass., Charlestown — (Boston P. O.) Shea & Donnelly, Summer St., Boston, will build a 1 story, 90 x 160 ft. mill on Roland St., here, for dressing and cutting of building stone. M. Sullivan, Boylston St. Boston, Archt.

Mass., South Braintree—(Boston P. O.) The Monatiquot Rubber Wks., Co. plans to rebuild its rubber reclaiming plant on Hancock St., which was recently destroyed by fire. Estimated cost, $100,000.

Mass., Worcester—The Worcester State Hospital, Belmont St., plans to build a cold storage plant. Estimated cost, $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Julo Bottling Co., Galveston, subsidary Southern Beverage Co., 200 West Camden St., Baltimore, plans to build a 2 story, 30 x 60 ft. bottling factory on North Ave. and Sherwood St., here. Estimated cost, $20,000. G. R. Callis, Jr. Amer., Bldg., Archt.

N. J., Trenton — The Trenton Zinc & Chemical Co., Broad St. Bank Bldg., plans to build a zinc plant. Pierce & Skoogmark, 140 Nassua St., New York City, Archts.

SOUTHERN STATES

Ga., Savannah — The Centennial Milling Co., 671 South Main St., Memphis, Tenn., plans to build a 2 and 3 story, 150 x 200 ft. mill construction building to have a daily packing capacity of 4,800 bbl.

N. C., Ayden — The Free Will Baptist Denomination plans to improve and build additions to its printing plant. Estimated cost, $100,000. J. E. Sawyer, Chn. Building Com.

MIDDLE WEST STATES

Ill., Chicago—Mariner & Hoskins, 4035 Kinzie St., chemists and Engrs., have awarded the contract for the construction of a 1 story, 40 x 100 ft. addition to their factory.

Ill., Chicago—W. W. Nugent & Co., 146 West Superior St., manufacturers of oiling systems, filters and devices, will soon award the contract for the construction of a 1 story, 50 x 128 ft. factory at 410 North Hermitage Ave. Pierce & Hauber, 10 South La Salle St., Archts.

O. Canton — The Continental Clay Co., Zinninger Bldg., plans to build a 2 story, 105 x 285 ft. sewer and hollow tile plant. Estimated cost, $350,000.

O., Canton — The Roller Printing and Paper Co., 215-25 Duvalt Ave., S. W., plans to build a 3 or 4 story, 62 x 100 ft. printing plant. Estimated cost, $50,000. T. B. C. Voges, Pres.

O., Cleveland—The Atlas Wheel Co. plans to build a 1 story addition to its factory at 2146 Scranton Rd. Estimated cost, $100,000. H. F. Arndt., Pres. Private plans.

Wis., Milwaukee—The Wisconsin Ice & Coal Co., 216 West Water St., plans to build a 1 and 2 story, 120 x 132 ft. ice making plant on Cambridge Ave. C. Ringer & Son, 432 Bway, Archt.

Wis., New Lonoun — The Wisconsin Cabinet & Panel Co. is having plans prepared for the construction of a 2 story, 60 x 180 ft. veneer mill, etc., on Main St. Estimated cost, $75,000. F. L. Zang, Genl. Mgr. Private plans.

Wis., Two Rivers—The Wisconsin Pail & Basket Co. is having plans prepared for the construction of a 2 story, 60 x 165 ft. basket factory on Main St. Estimated cost, $100,000. J. F. Conant, Pres. K. Conant, care of owner, Archt.

WEST OF THE MISSISSIPPI

Ark., Little Rock — The People's Ice Co., 712½ West 9th St., will soon receive bids for the construction of a 1 story, 150 x 200 ft. ice plant on 9th and Thayer Sts. Estimated cost, $100,000. Moody, Knight & Lewis, 512 A. O. U. W. Bldg., Engrs. and Archts.

Ia., Cedar Rapids—The Peterson Baking Co., 316 6th Ave. E., will soon open bids about March 20, for the construction of a 2 story, 40 x 100 ft. factory on 3rd St. and 6th Ave. E. Estimated cost, $50,000. H. A. Rundquist, Mgr. Hatton, Holmes & Anthony, 323 Masonic Temple, Archts.

Minn., Brainard—The Farmers Terminal Packing Co., 319 Guardian Life Bldg., St. Paul, plans to build a 3 story, cold storage plant. Estimated cost, $50,000. H. E. Edmunds, Secy. and Treas. Private plans.

Minn., Browerville—Nathe & Alden have awarded the contract for the construction of a 2 story, 40 x 80 ft. creamery on Main St.

Mo., St. Louis—The Missouri Car Co., 410 Fullerton Bldg., is having plans prepared for the construction of a street car factory along the tracks of the Chicago, Rock Island and Pacific R.R. and Ladue Rd. Estimated cost, $150,000. Private plans.

Mo., St. Louis — H. Paul & Sons, 1309 North 15th St., manufacturers of mirrors and show cases, have awarded the contract for the construction of a 1 story, 20 x 50 ft. factory at 1321 North 15th St. Estimated cost, $35,000.

N. D., Williston—The Farmers Creamery & Produce Co. plans to improve its creamery and install new refrigerating plant, 2 pasteurizing machines, etc. H. C. Blankenship, Secy.

Okla., Springfield—The city plans to install an ice and cold storage plant. Address the Mayor.

Tex., Uvalde—W. A. White, Box 247, plans to establish a plant for the manufacture of soap.

WESTERN STATES

Utah, Monticello—Local farmers in conjunction with the Anglo Amer. Mill Co., c/o J. W. Hanson, plan to build a flour mill. Estimated cost, $15,000.

CANADA

Man., Transcona—The Dept. of Railways and Canals, Ottawa, has awarded the contract for altering and building additions to its coach paint shop, here. Estimated cost, $22,000.

Ont., Amherstburg—The Conklin Planing Mills is having plans prepared for the construction of a planing mill, storage building and lumber sheds. Estimated cost, $75,000.

Ont., Guelph—The Sterling Rubber Co. plans to rebuild its plant which was partially destroyed by fire. Loss about $75,000.

Que., Hull—J. B. Larose, 102 Montcalm St., plans to rebuild his mattress factory. Estimated cost, $25,000.

See "SEARCHLIGHT" for Business Opportunities